Rock Products

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Wisconsin's Newest Crushing Plant in Class by Itself

The Recently Completed Plant of the Leathem D. Smith Co., Sturgeon Bay, Wis., Differs from Any Other Plant in the Country; Produces 2500 Tons Daily; Has a Storage Capacity of 30,000 Tons; No Revolving Screens or Elevators; More Than 1740 Feet of Conveyors

A PERSON who is familiar with the rock products industries, in visiting the plant of the Leathem D. Smith Stone Co., near Sturgeon Bay, Wis., would get the impression from his first look at the plant that it is a big sand and gravel plant. For, in approaching it from Sturgeon Bay, all that can be seen is a mass of shining corrugated steel roofing covering conveyors mounted from 75 to 100 ft. in the air. It is not until one is very close to the plant that the long face of dolomitic stone can be seen.

The quarry serving the new plant has been operated for several decades, and until last year it supplied an old plant of ancient design which had threatened for several years to collapse. Stone was taken to it up an incline after a long haul from the quarry; this was an expensive operation. Officials realized the necessity for a new plant, but did not begin constructing one until they had made plans to the minutest detail. Their purpose was to build a plant that would, first of all, afford a truly economical operation; and second, one that would have a normal daily output of at least 2000 tons. In selecting equipment, consideration was first given to maintenance and operating costs, and first costs became a matter of secondary consideration.

General view of the plant proper obtained immediately upon plant's completion. The primary and the first secondary crusher are at the extreme left. The building shown in the center houses the grizzly separators and secondary crushers. In the background a freighter is being loaded

The Smith company's operation is about four miles northwest of the town of Sturgeon Bay, on Sturgeon Bay, midway between Lake Michigan and Green Bay, and has no railway outlet, all of its shipments being by water. The original plant was at the water's edge so that stone could be loaded from the bins direct into boats. It also had an outside storage which was filled by conveyors and emptied by un-

This view gives an idea of the proximity of the new plant to the quarry

derground conveyors discharging directly into boats. The method of operation with the old plant, however, was expensive when there were no boats at the dock to be loaded, for it became necessary to haul the stone a great distance to the plant; after being crushed it was conveyed several hundred feet in the same direction from which it had been hauled in order to store it. That is, in order to store it, it was necessary to do a double amount of handling.

The original plant. Stone had to be hauled a great distance and pulled up an incline to the plant. This operation has been wrecked

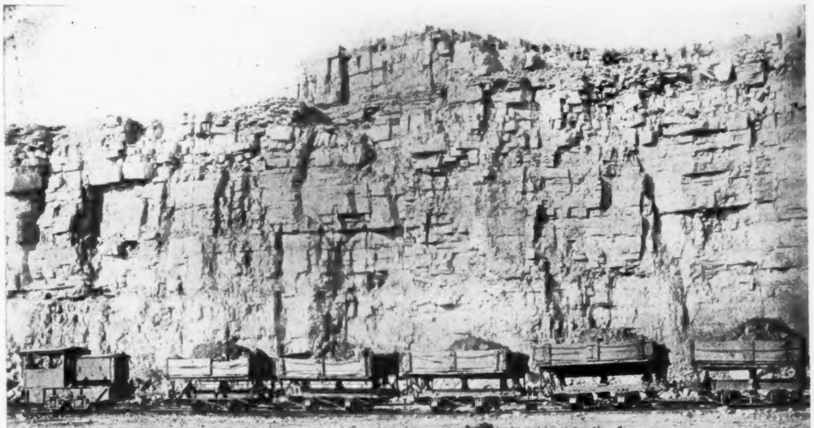
To overcome this disadvantage the new plant was built at the quarry. The quarry had been worked in two levels, the lower one being 50 ft. and the upper one 40 ft. high. Thus, by mounting the primary crusher's foundations on the lower floor and operating only the upper level, a short down-grade haul from the shovel to the crusher was afforded instead of the old method, necessitating a long haul and an incline to the crusher.

New equipment installed in the quarry to harmonize with the new plant's equipment included two Model 70 Bucyrus steam shovels with 2½-yd. dippers. These are served by three locomotives—a 14-ton American, a 14-ton Baldwin and a Whitcomb, gasoline powered. Each locomotive handles a train of six 4-yd. Western dump cars. Drilling is done by two Sanderson Cyclone well drills—one gasoline powered and the other, recently installed, electrically powered. No secondary drilling is necessary as the primary breaker will take any size stone that can be loaded by the shovels.

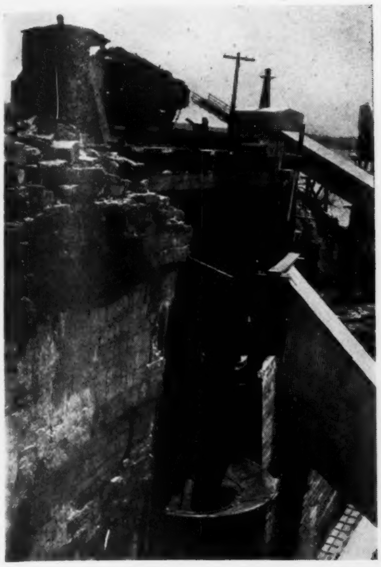
The primary crusher is a No. 21 (42-in. opening) Worthington Superior gyratory of the short-shaft type, rope driven by a 200-hp. motor. The top of this machine is but a few feet below the level of the upper ledge floor and the loaded cars are dumped direct into it from a track running along the edge of the face. The crusher discharges at 4 in. into a No. 10 McCully gyratory. This crusher's receiving hopper is approximately 8 ft. below the discharge spout of the larger crusher and the stone is chuted over a concave cross-section adjustable grizzly set at 40 deg. and spaced at 4 in. Material passing through the grizzly is chuted to conveyor No. 1, which also takes care of the product of the No. 10 crusher, set to discharge at 2½ in. This machine is individually driven by a 100-hp. motor.

Conveyor No. 1 is a 36-in. belt of 150-ft. centers, inclined at about 18 deg., and leads to the screens. It is driven by a 40-hp. motor. Instead of emptying direct into the primary screen it empties in a box from which it flows over a moderately inclined chute to the screen. The primary separator is a Robins Cataract grizzly of 3½-in. square mesh and is driven off the head pulley of the main (No. 1) conveyor. The rejections from this grizzly are chuted to a No. 5½ Austin and a No. 6 Gates

Conveyor No. 1 is a 36-in. belt of 150-ft. centers leading from the primary breakers to the grizzlies



This is the upper level which serves the new plant. Note the absence of overburden. A gasoline locomotive and a train of 4-yd. cars in foreground



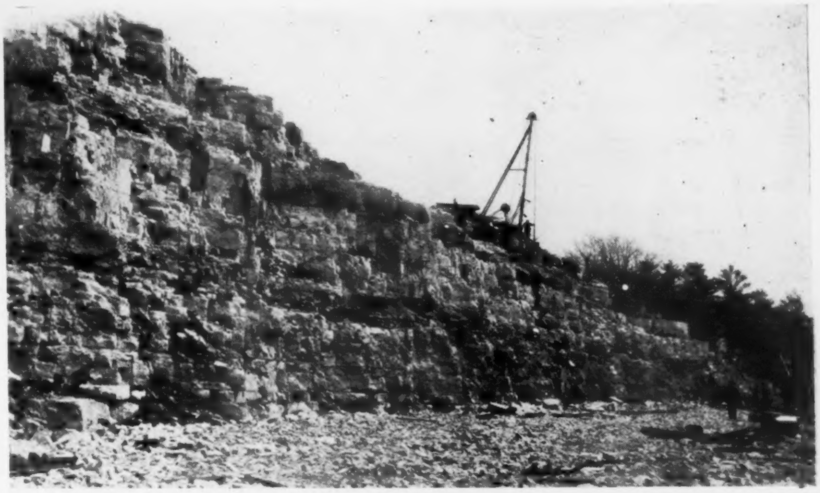
The primary and the first secondary crusher are in tandem below the second level's floor. Cars are dumped direct into the first crusher

gyratory crusher. The material passing through the screen is chuted and fed to a second grizzly of the same make having 1¾-in. square openings. Rejections from this machine—1¾x3½ in.—are fed to conveyor No. 3, which is a 24-in. belt of 150-ft. centers, driven by a 10-hp. motor, leading to an outside storage. The product of the second grizzly is removed by a 30-in. conveyor of 167-ft. centers, which is termed locally conveyor No. 4. This conveyor is driven by a 25-hp. motor, and, like conveyor No. 3, is mounted on a framework approximately 60 ft. high, the bents of which are set on concrete foundations.

The two secondary crushers discharge on conveyor No. 2—a 24-in. belt of 100-ft. centers—which runs parallel to the main conveyor in the direction of the primary crusher. At a point approximately two-thirds of the distance between the small crushers and No. 21, it discharges into a box, from which the material is chuted to the main conveyor and is again carried to the grizzlies. Conveyor No. 2 is driven by a 7½-hp. motor.

The product of the second grizzly, which is taken away by conveyor No. 4, is smaller than 1¾ in. This conveyor extends to a point just within the open storage area, and at that point is approximately 80 ft. above the ground. Here it discharges into three Universal electric vibrating screens, two of which are provided with 1¼-in. square openings. The rejections (1¼x1¾-in.) of this screen are carried on a 24-in. by 100-ft. conveyor (No. 5). At the end of this conveyor is mounted a Stephens-Adamson automatic tripper which relieves the belt of its load and empties it in storage.

The stone which passes through the 1¼-in. screens falls on a third screen of 3/16-in. round openings, the product of which is removed to storage over a 16-in belt of 80-ft. centers running at right angles to the other conveyors. Material rejected by the 3/16-in. screen (larger than 3/16 in. and up to 1¼ in.) is discharged on conveyor No. 6, which runs in the same direction and underneath conveyor No. 5. This belt carries the 3/16 to 1¼-in. material 40 ft. beyond the discharge point of the 1¾-in. material and discharges it into a second battery of Universal vibrating screens. This battery com-



Opposite end of the quarry. The height of the ledge at this point is 40 ft. and the overburden is negligible. The well drill is electrically powered

One of the 70-ton shovels at work on the upper level. The face is 1400 ft. long

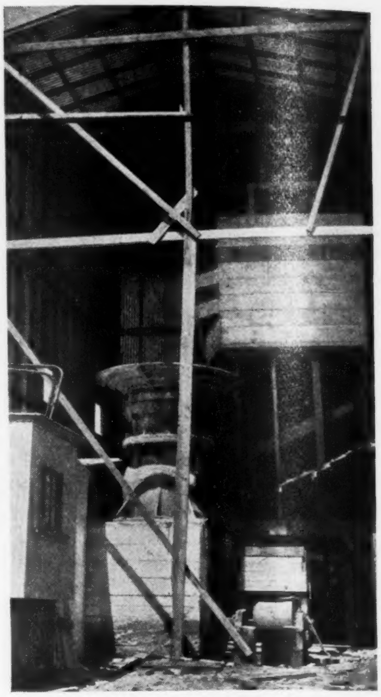
This grizzly (between the No. 21 and No. 10 crushers) is adjustable and can be set to conform with the adjustment of the crusher

The foundations of both crushers are mounted on the lower floor level. The No. 21 is rope driven

prises four screens which separate the stove into two sizes—3/16 to ½ in. and ½ to 1¼ in. In these screens the material is washed as it is screened, the water being furnished by a No. 4 American Well Works pump. The smaller size is removed by conveyor No. 7, which is a 16-in. belt of 60-ft. centers discharging into storage. The larger size is chuted directly from the screen into storage underneath. Thus, with two grizzlies, seven vibrating screens and 1147 lineal feet of conveyors, the company produces and stores five distinct sizes: 1¾ to 3½ in., 1½ to 1¾ in., ½ to 1½ in., 3/16 to ½ in. and dust to 3/16 in. Locally, these sizes are referred to, respectively, as 3½ in., 1¾ in., 1¼ in., ½ in. and screenings.

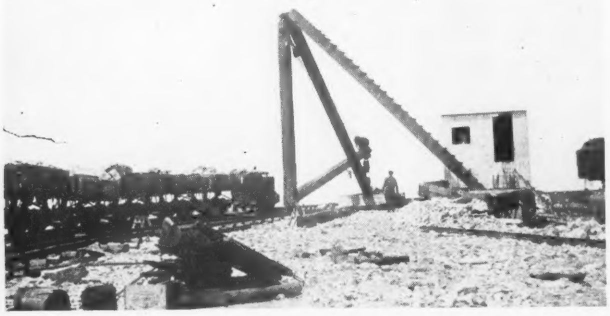
Reclamation is accomplished by underground conveyors. All of the sizes, excepting the screenings, are stored in a straight line. That is, one set of conveyors extend underneath the storage its full length and serve to remove any one or all sizes.

Two 30-in. belt conveyors, 350 ft. between centers, run parallel to each other under the storage and are housed in concrete tunnels. Gates, together with spouts, are provided approximately every 15 ft. Both conveyors are driven by one 50-hp. motor through clutches so that either may be operated independently of the other. The screenings are stored separately, being taken from the vibrating screens on an 80-ft. conveyor running at right angles to the main conveyors. This product is reclaimed by a 30-in. belt of 100-ft. centers, which empties on one of the main reclaiming conveyors. The main conveyors extend to the dock, where they discharge into spouts.



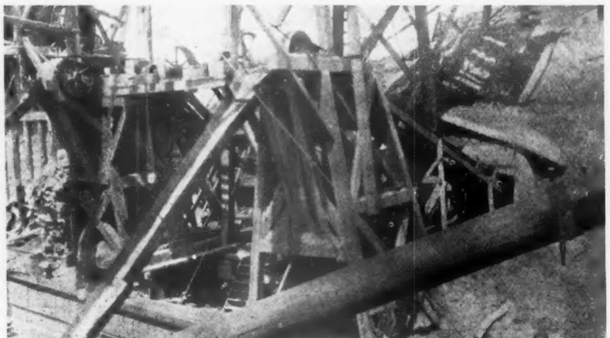
Both of the grizzlies are mounted above and to one side of the secondary crushers

These spouts, or chutes, are movable, so that the material can be evenly distributed in the boats without handling. Each con-



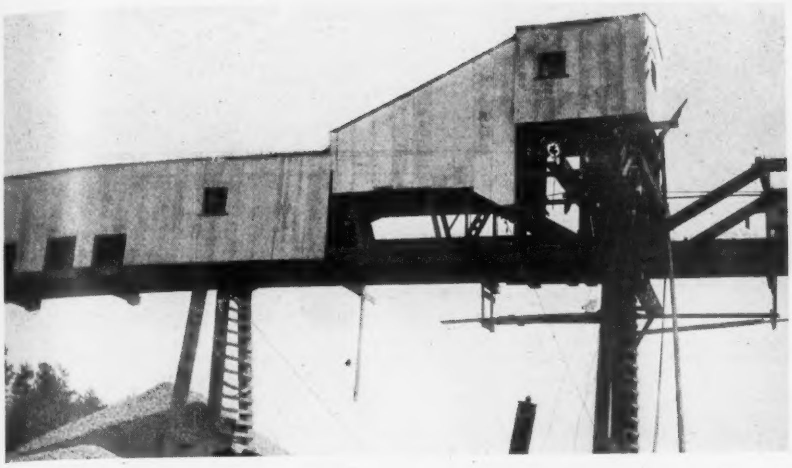
The derrick used in setting up the two crushers will remain and will be used to make repairs

The conveyor at the right handles the 3½-in. material. At the left, part of the 350-ft. storage



Showing the two reclaiming conveyors emptying into a boat

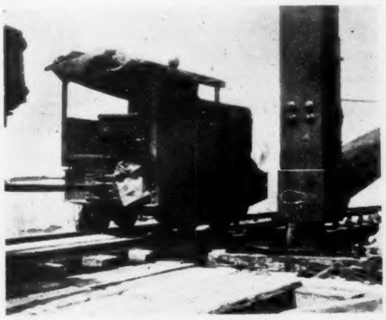
One of the freighters being loaded at the company's dock



A section of the main storage conveyor showing the second battery of vibrating screens

veyor handles 300 tons of material per hour —a total daily capacity of 6000 tons.

The plant has only recently been completed, having made its trial run on May 1. A few minor changes were found necessary at that time relative to the tension of the belts, the screen adjustments and



This gasoline locomotive brings in six 4-yd. cars in a train

remodeling the chutes. But these changes have been effected and the plant is now operating successfully.

The completed plant as it stands has a 10-hr. capacity of 2500 tons. However, it is so designed that by the installation of additional separating equipment and secondary crushers, and by the speeding up of conveyor and transmission belts, its capacity can be increased to 10,000 tons per 10-hr. day. Plenty of room was left opposite all the units for the necessary additional machines so that the plant can be enlarged without wrecking it, as is usual in most cases. This, of course, will necessitate additional loading equipment and cars in the quarry.

The president of the company is Leathem D. Smith, who designed and supervised the construction of the plant. Mr. Smith is assisted in the operation of the plant and quarry by Fred Lau, general superintendent. G. H. Smith, Mr. Smith's wife, is vice-president and F. H. Behringer is secretary and treasurer.

Leathem D. Smith, president and general manager and designer of the new plant

LIME CONVENTION

THE fifth annual convention of the National Lime Association will be held in New York City, on June 13, 14, and 15.

Bedford-Bloomington Production in 1922

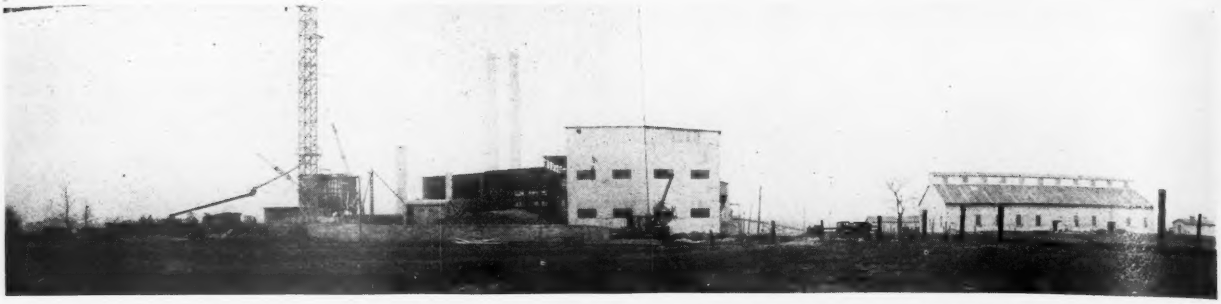
THE limestone sold for building stone from quarries in the Bedford-Bloomington district, Indiana, in 1922 amounted to 9,616,670 cu. ft., the largest output since 1912. This great demand in 1922 is reflected in a gain of 81 per cent over the quantity sold in 1921, and orders ahead for shipments in 1923 indicate that unless unexpected conditions arise the output will be equal to or greater than that in 1922. The total value in 1922 was $11,288,823. These figures are from reports by the quarrymen and operators in the district to the U. S. Geological Survey.

Notwithstanding reports from the producers that prices remained about the same in 1922 as in 1921, only a slight advance having been made in the last part of the year, and that the cost of fuel and other raw materials increased operating expenses, the average value per cubic foot of all stone sold decreased from $1.29 in 1921 to $1.17 in 1922.

The value of the stone sold by the mills was $3,706,900. Thus the total gross value of the building stone sold in this district, including the value added to the product by manufacturers, was about $15,000,000. The rough blocks sold by the quarrymen in 1922 (4,189,547 cu. ft.) represented a gain of about 86 per cent over 1921. The average value decreased from 67 cents a cubic foot in 1921 to 58 cents in 1922. The sawed stone sold (3,635,744 cu. ft.) a little more than doubled in quantity, but its average value per cubic foot decreased from $1.05 in 1921 to 94 cents in 1922. The dressed stone sold (1,791,379 cu ft.) increased 44 per cent in quantity and its average value per cubic foot increased from $2.76 in 1921 to $3.02 in 1922.

Almost 90 per cent (1,005,210 cu. ft.) of the building stone sold in 1922 was shipped out of the state. Illinois, the principal market for this stone, received 2,043,851 cu. ft.; New York received 1,301,539 cu. ft.; Ohio, 843,517 cu. ft.; Michigan, 837,279 cu. ft.; Pennsylvania, 820,163 cu. ft.; and 36 other states received different amounts, not more than 270,000 cu. ft. for any one state. Canada received 310,847 cu. ft.

The waste product of some of the quarries is sold in small quantities and at comparatively low prices for use as riprap, furnace flux, road stone and ballast, and for agricultural use. Other waste stone is more carefully selected and sold to glass works, pulverized for use as agricultural limestone, and crushed for use in concrete and in road making. The output of this material in 1922 was 214,722 short tons, valued at $139,233, an increase of 53 per cent over that sold in 1921. The average value per ton in 1922 was 65 cents; in 1921 it was $1.04. The figures given do not include stone that was burned into lime in the district.

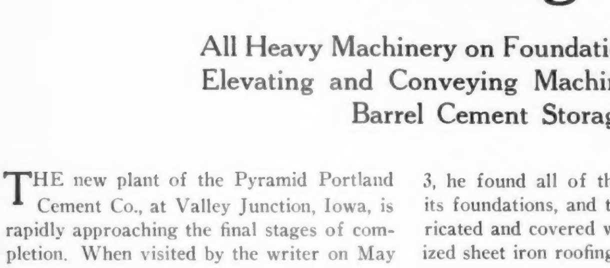


End view of plant showing cement warehouse under construction. Directly to the right of it is the coal-pulverizing unit and kiln feed. The covered building in the center is the raw material and clinker storage house. At the extreme right is the office, machine shop and tool and supply rooms

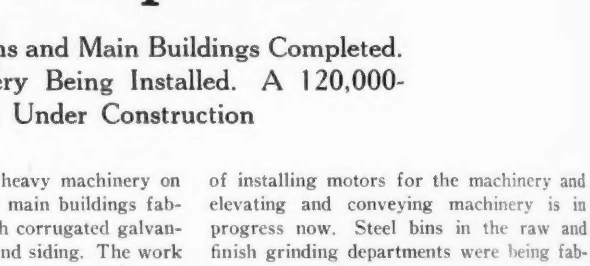
The Pyramid Portland Cement Plant Is Nearing Completion

All Heavy Machinery on Foundations and Main Buildings Completed. Elevating and Conveying Machinery Being Installed. A 120,000-Barrel Cement Storage Under Construction

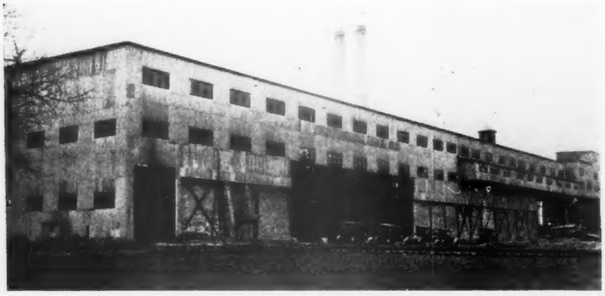
THE new plant of the Pyramid Portland Cement Co., at Valley Junction, Iowa, is rapidly approaching the final stages of completion. When visited by the writer on May 3, he found all of the heavy machinery on its foundations, and the main buildings fabricated and covered with corrugated galvanized sheet iron roofing and siding. The work of installing motors for the machinery and elevating and conveying machinery is in progress now. Steel bins in the raw and finish grinding departments were being fab-



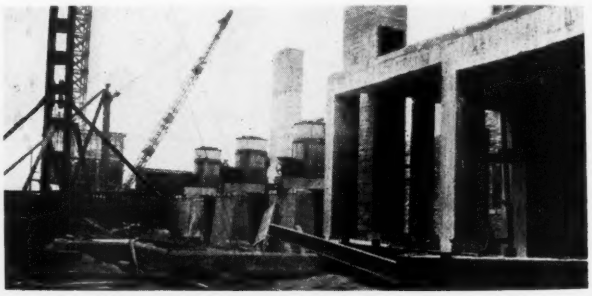
The raw material and clinker storage house. At the right is the belt-conveyor galley leading from crushing plant



The coal-pulverizing unit on foundation. The coal injectors, blowers and kiln hood will set on foundation shown in foreground

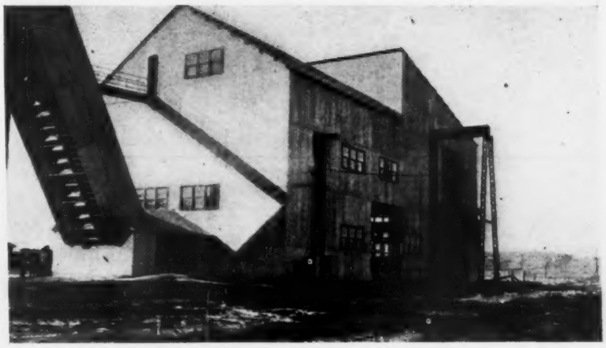


The tube mills are located between the kilns and the kominuters



The kominuters for both raw and finish grinding. They discharge to the tube mills for final grinding

Kiln hoods and firing end of kilns. Stacks in rear are from driers



The crushing plant—steel-constructed throughout

ricated and the foundations being poured for a 120,000-bbl. cement storage at that time.

In the May 6, 1922, issue of Rock Products there appeared a progress report of the plant at that time. It discussed the aims of the new company and the sources of raw materials. The stone is brought over from the company's quarry at Gilmore City, Iowa, in 50-ton gondola cars to the crushing plant at Valley Junction. The loaded cars are hoisted up an inclined tramway on one side of the crushing plant and put on a rotary car dumper which sets directly over a No. 36 McCulley gyratory crusher. The crushed material is reclaimed by a 54-in. wide, 60-ft. centers, bucket elevator, set at 45 deg. from the horizontal. The stone is deposited in a steel hopper feeding a secondary crusher. From here it is reclaimed by a 54-in. bucket elevator which deposits to the stone screens. Stone for commercial purposes drops to the bins below while the stone required for cement-making is taken on a belt conveyor and deposited in the main storage building. The crushing plant is complete and ready to run.

The Main Storage Building

The main storage building is practically complete with the exception of installing an overhead electric traveling crane for handling new and finished materials, as well as the coal and gypsum. The building is 78 ft. wide and 400 ft. long. One end will hold

The Worthington No. 36 initial gyratory crusher—car dumper overhead

20,000 tons of stone and shale; the other end, 7000 tons of coal. Between the coal and shale will be a 100,000-bbl. clinker storage. The crane will distribute and proportion the raw materials as well as handle the clinker and coal.

The Raw Grinding Department

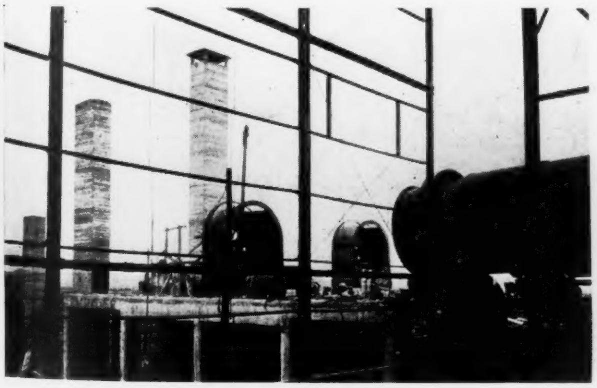
The raw grinding department consists of two F. L. Smidth kominuters where the mixture is ground wet. It then goes to a No. 20 Smidth tube mill for final raw grinding. The slurry is delivered to three connectting basins holding 600 bbl. each. From here it is transferred by gravity to a mix basin of 2000-bbl. capacity. The slurry is then taken by an air-lift pump to the kiln feed tank holding 2700 bbl., after which a slurry pump delivers the raw mix to the kiln feed. This unit is practically complete with the exception of the motors and the agitators for the various basins.

All of the kilns are set to work, it only being necessary to finish the coal pulverizing department until it is complete. The kilns (there are two, 10x240-ft., with an enlarged firing zone 11 ft. 3 in. in diameter) are being lined with firebrick and Sil-O-cel will be used to insulate that section 60 ft. after the firing zone.

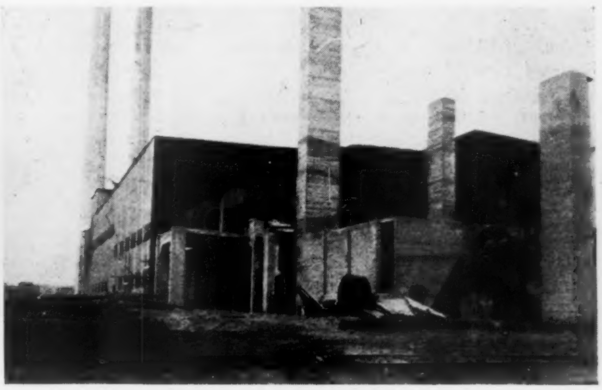
The Coolers

The two coolers, 7x70 ft. are complete excepting the apparatus to be used for taking hot air from the coolers and injecting preheated air to the kilns. The clinker is belt conveyed to the storage aforementioned.

The finish grinding department consists



Coal driers and stacks; kiln hoods and kiln ends



Looking toward kiln-firing end. Driers are enclosed in brickwork

The Pyramid Portland Cement Co.'s plant at Valley Junction, Iowa. At extreme left is stone-crushing department. Building in foreground houses kilns and grinding machinery

of three kominuters and two No. 20 Smidth tube mills. The finished cement is conveyed to the warehouse, now under construction. It will consist of six silos 32 ft. in diameter and 80 ft. high, with a total capacity of 120,000 bbl. Valve bag machines will be used for sacking.

The Coal Pulverizing Department

The coal pulverizing department is as mentioned last year only that three Raymond mills have been selected to pulverize the coal for burning. The machines are on their foundations. The driers are enclosed in brickwork and have concrete stacks.

The transformer station and switchboard are practically complete and the remainder of the necessary electrical work is progressing. Since last year a large water tank has been added.

H. Struckmann, president of the company, who is constructing the plant, hopes to turn out clinker by July 1 of this year.

Australian Gypsum Industry

GYPSUM is found in various parts of the commonwealth of Australia, says Trade Commissioner J. W. Sanger in *Commerce Reports*, but it is at present mostly worked in Victoria and South Australia, although the Hay, Hillston and Mossgiel districts of New South Wales have also given good results, and very large deposits have been found near Lake Austin and Lake Seabrook in western Australia. The production of Victorian gypsum in 1920 amounted to 3393 tons, valued at £1696, chiefly from Lake Boga, while 40,000 tons, valued at £32,000, were obtained in the same year from southern Yorke peninsula in South Australia. A plant for the manufacture of plaster of paris has been erected at Dry Bone Lake, South Australia, but architects say that there is room for other plants of this kind to meet the present and future demand.

Australian gypsum occurs in two forms—large crystals and a floury earth consisting of minute crystals, known as "copi." It is used largely as a natural manure, especially for light moist soils, and recent experiments at Goroke, Victoria, have given wonderful results in wheat growing. A dressing of 1.5 tons an acre applied with 1 hundred-weight of superphosphates increased the yield by 20.9 bu. an acre, as compared with the crop grown without manure. Superphosphate by itself increased the yield on another plot by 9.8 bu. per acre, so that the effect of the gypsum was to increase the yield by 11.1 bu. The chief difficulty in the way of the extensive use of gypsum for fertilizing is the price which, at £2 5s. per ton, is considered too high for more than experimental work. However, with such large and easily procurable deposits, the expansion of the Australian industry would seem to be only a matter of time, and good prospects await the opening up of this industry.

Australian imports of gypsum in 1920-21 were 1057 tons, valued at £15,902, from the United Kingdom, and 188 tons, valued at £1355, from the United States. Exports of gypsum of Australian production in the same year amounted to 3155 tons, valued at £4633, all but 1 ton of which was sent to New Zealand.

Australian imports of plaster of paris in 1920-21 amounted to 1542 tons, valued at £21,217. The countries of origin, amounts exported, and values were: United Kingdom, 237 tons, valued at £3041; Canada, 286 tons, at £2932; New Zealand, 67 tons, at £1384; Italy, 25 tons, at £350; United States, 927 tons, at £13,510. Australian exports of plaster of paris in the same year amounted to 1095 tons, valued at £10,151, all but 2 tons of which went to New Zealand.

There is a certain amount of importation of American wallboard, and this is proving popular and is likely to continue in demand. Thus far, gypsum has been little used in the Australian building trade. Gypsum hollow tiles and blocks are seldom in demand. Concrete is more popular, but many builders consider gypsum superior to concrete on account of its being waterproof.

Scientific Bulletins on Gypsum in Agriculture

THE Necessity of Sulphur Carriers in Artificial Fertilizers—By Dr. William Crocker of the Thompson Institute of Plant Research.

Reprinted from the Journal of the American Society of Agronomy, Vol. 15, No. 4, April, 1923. A dissertation of the role sulphur plays in connection with crops produced as determined through careful scientific research, followed by a discussion of the relative sulphur and phosphorus content of soils, both absolute and as measured by crop removal.

The Effect of Gypsum on Iowa Soils—By Dr. L. W. Erdman, State College of Washington.

Reprinted from Soil Science, Vol. XV, No. 2, February, 1923. Publication of research work conducted at the Iowa State College, followed by a discussion of various soil types tested in experiments.

Gypsum in Agriculture—By. Dr. Frank A. Wilder, North Holston, Va.

From Vol. XXVIII, Annual Reports, published by the Iowa Geological Survey, 1923. Reissued by the Gypsum Industries. A treatise on agricultural gypsum, including history of past and present-day methods and uses.

An Investigation of Sulphur as a Plant Food—By G. A. Olson and J. L. St. John, Agricultural Experiment Station, Pullman, Wash.

Bulletin No. 165. Study of work conducted on various crops and soil types in the state of Washington, followed by complete bibliography on sulphur investigators.

The above bulletins may be had free of charge by applying to the Research Department of the Gypsum Industries, 844 Rush street, Chicago, Ill.

Limestone as a Constituent of Explosives

LIMESTONE, more or less pure, is used in many types of blasting explosives, as it acts as an antiacid, state C. A. Taylor and William H. Rinkenbach, assistant explosives chemists, of the Department of the Interior, in Bulletin 219, recently issued by the Bureau of Mines.

The form in which it is used ranges from a rather pure calcium carbonate to marble dust containing as much magnesium as calcium. Generally it is used as the only antiacid, but sometimes with another antiacid, such as zinc oxide. The average dynamite contains less than 1.5 per cent of calcium carbonate, but special powders have contained as high as 15 per cent. The impurities in limestone are of no practical importance in the manufacture of explosives.

Few limestone quarrymen who buy thousands of dollars worth of explosives probably know that their limestone is a requisite to dynamite manufacture. The story of limestone and its uses has never been told. It surely will be a long one.

New Cement Works in New South Wales

THE Sulphide Corporation, Ltd., has decided to establish cement works at Cockle Creek, New South Wales. The company will proceed immediately with the construction of the first unit of the plant, which is to be capable of producing 30,000 tons of cement a year. This plant will probably be duplicated later on, Trade Commissioner J. W. Sanger, Melbourne, Australia, reports to the Department of Commerce.

Nature, Preparation and Use of Pulverized Coal*

I—Formation, Kinds, and Composition of Coal

By Richard K. Meade
Chemical and Industrial Engineer, Baltimore, Md.

IN all fields of industry, heat and the effects produced by its agency play a most important part, and in every branch of modern manufacturing either heat or the power obtained by means of heat is employed to some degree. The agencies which can be employed for producing heat are therefore of the utmost interest to everyone.

Almost any substance which can be burned in air may be employed for heating, but the chief source of artificial heat is coal, and the great manufacturing nations of the world are those which have abundant supplies of coal. The rise of Great Britain to be a world power came as the result of the development of her coal industry. Germany's importance in Europe rose with the acquisition of each new coal field and the loss by France of the coal fields of Alsace-Lorraine was a blow to both her commerce and industry from which she has never recovered.

The wonderful progress made by America in the last century has unquestionably been due to her splendid coal resources—the greatest in the world. But for these she would have been devoted to agriculture and grazing, like Brazil and the Argentine.

We do not know when or by whom coal was first discovered. The Greek historians refer to coal as early at 308 B. C. and it was actually used in Great Britain long before the Norman conquest. Coal was supposed to have been used for practical purposes in that country first and coal mining was established there as an industry as early as the twelfth century.

Coal was first discovered in the United States by Father Hennepin near Ottawa, Ill., in 1679. The first coal mined was at Richmond, Va., in 1750. Anthracite was mined in 1793, but owing to the difficulty of igniting this form of coal it did not come into general use until the second quarter of the nineteenth century. Obediah Cole, a blacksmith, is said to have been the first to use anthracite coal industrially, when he employed it in his smithy at Wilkes-Barre, Pa., near the close of the eighteenth century. It was not placed on the market until 1820, when 380 tons of it were sold during that year.

Bituminous coal was employed before this, but, on account of the difficulty of transportation and the abundant supply of wood then found in most sections of the country, its use was largely local. With the building of the railroads and canals, however, a wider distribution was afforded and the use of coal gradually became general throughout the country.

Richard K. Meade

Under normal conditions, this country consumes annually approximately half a billion tons of coal. This is distributed about as follows (see Fig. 1):

Name of Industry	Tons of Coal Used
Steam railways	140,000,000
Coke plants, not including gas plants	85,000,000
Domestic consumers	55,000,000
Electric utilities	40,000,000
Steel plants	35,000,000
Cement plants	8,000,000
Coal-gas plants	5,000,000
Lime plants	1,200,000
Other industries	130,800,000
Total	500,000,000

Formation of Coal

Coal resulted from the decay of vegetable matter in past ages. Different periods of the earth's history seem to have been devoted to different forms of animal and vegetable life. Thus we have the age of mollusks, during which all the living things of which we have record were shell fish. This was followed by a period when fish represented the chief form of life. Another period was that of the reptiles, when the monster lizards lived. In between these last two periods came the coal-forming period.

This was a period of giant vegetation, during which boundless forests and jungles were found. These latter were submerged under water by volcanic action, covered with sand and other materials and so preserved from complete decay. Eventually great volcanic upheavals thrust them up out of the seat to their present elevations. During this time, various chemical and physical changes, due to heat and pressure, took place in the vegetable material composing the beds. It lost much of its water and other volatile matter and became more dense and uniform. Its cellular structure also disappeared during these processes.

Coal may thus be looked upon as the energy of one epoch which Nature has kept for another—the vast forests and giant flora of the Carboniferous era preserved for the use of the present. Hence, it represents a legacy from Mother Nature to her children of this day and, as is the duty of all those who inherit a vast estate, it behooves us to use it wisely.

Kinds of Coal

Naturally, the changes by which coal was produced did not proceed at the same rate or in the same degree in all parts and hence the coal from various localities differs markedly in chemical and physical characteristics. Thus we have anthracite coal, in which the chemical decomposition has gone so far that almost all the volatile matter has been expelled and a hard, compact coal has resulted, while in the bituminous coal, much of the original volatile matter of the wood is still left.

Coal may be roughly divided into four general classes, according to the relative

percentages of volatile matter and fixed carbon:

Class	Volatile Matter	Fixed Carbon
Lignite	50% and over	Up to 50%
Bituminous	25 to 50%	75 to 50%
Semi-bituminous	7.5 to 25%	92.5 to 75%
Anthracite	2.5 to 7.5%	97.5 to 92.5%

These four classes may be looked upon as representing a progressive change from wood, or vegetable matter, to pure mineral carbon, or graphite, in the order named.

Lignite or brown coal may be regarded as the first stage between wood and coal. It was formed in a more recent geological period than the other three classes of coal and contains much more water and ash than these. Lignite is usually found west of the Rocky mountains—indeed, almost all the coal found in that locality is lignite.

Bituminous coal varies much in its characteristics and composition and is subdivided according to the way it acts in burning into *non-caking* and *caking coal*. Non-caking coal burns freely, with but little smoke, and

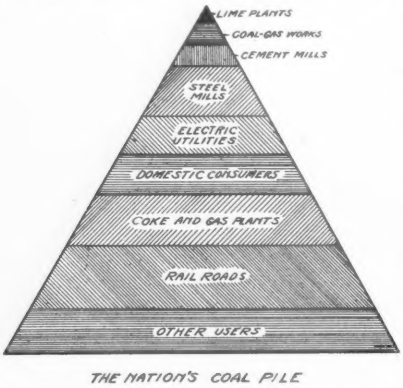


Fig. 1—Graphic representation of the distribution of coal in the United States

does not cake together when burned. Caking coals cake when burned and produce an appreciable amount of smoke and flame. Wyoming coals are an example of non-caking coal, while New River and Connelsville coals are caking.

Semi-Bituminous coal is upon the border line between the bituminous coal on the one hand and the anthracite on the other. These coals are sometimes called *semi-anthracite* when they resemble the anthracite more closly than bituminous coal. Semi-bituminous coals are among the best steaming coals. Pocahontas is a semi-bituminous coal.

Anthracite is the hardest, most lustrous, and densest form of coal. It contains less volatile matter and more fixed carbon than the bituminous coals and is much harder to kindle than the latter. Anthracite is usually sized before being sent to the market. The larger sizes are chiefly for domestic and metallurgical uses, while the small sizes—pea, buckwheat, rice, barley and culm, are used for steam-generation, lime-burning, etc. The smaller the size of the anthracite, the more ash it contains.

Composition of Coal

The combustible part of coal is composed chiefly of carbon and hydrogen. The mineral matter constitutes the ash. Coal contains some water, and also oxygen, sulphur, and nitrogen. Only the carbon and hydrogen are of value as heating agents. Sulphur in large quantity is objectionable, while oxygen not only has no heating value itself but it uses up one-eighth of its own weight of hydrogen. The hydrogen is present in the volatile matter of the coal, while the carbon is present in two forms—in combination with the hydrogen as volatile carbon and free as fixed carbon. When we heat coal in a closed space, the volatile matter is driven off, leaving the fixed carbon (and ash) behind. Table I gives some examples of various kinds of coal.

The calorific value of a fuel is usually expressed as the numbers of British thermal units (B.t.u.) per pound. One B.t.u. is the amount of heat necessary to raise the temperature of one pound of water one degree Fahr. Thus, one pound of Pennsylvania anthracite of the analysis given would raise 13,810 lb. of water from 40 to 41 deg. Fahr. if all the heat it contains could be so utilized.

Value of Fuel

In purchasing fuel, the important considerations are: 1. Is the fuel adapted to the use to which it is employed? 2. The cost of heat units. The latter is very often expressed as the number of cents which 1,000,000 heat units will cost. A better way is the number of B.t.u. which can be obtained for 1 cent. Table II gives the relative cost of heat as obtained from coal, oil, and natural gas, based purely on the heating value of these fuels.*

Engineers frequently express the heating value of coal as the amount of water which it will evaporate at and from a temperature of 212 deg. Fahr. and under atmospheric pressure, or, in other words, the number of pounds of water which has been previously heated to 212 deg. which can be evaporated with free escape of the steam. Under these conditions, it requires 966 B.t.u. to evaporate a pound of water, so that the Pennsylvania anthracite coal given would evaporate theoretically about 14¼ lb. of water.

There is also a direct relation between the heating value of coal and a mechanical horsepower. One horsepower is considered the equivalent of 42.42 B.t.u. per minute or 2545 B.t.u. per hour. If we could transfer all of the energy which is in the anthracite coal as given to the engine, we would obtain for each 2545 B.t.u. one horsepower, or if we supplied this number of B.t.u. in an hour we would obtain one horsepower hour. Similarly a kilowatt-hour is equivalent to 3412 B.t.u. per hour and one pound of the Pennsylvania anthracite coal if burned in one hour would produce 5½-hp. hours, or about 4 kilowatt hours. Unfortunately, there are many losses between the burning coal and the power delivered by the engine, and even a so-called efficient power plant does not often produce more than 15 per cent of the

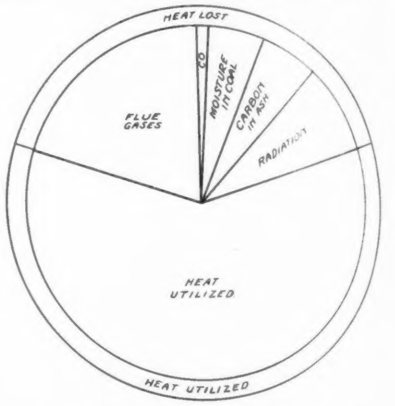


Fig. 2—Graphic representation of the average distribution of the calorific value of fuel in steam generation by hand firing of coal on grates

theoretical power which the coal liberates.

Most of these losses occur in the engine, however, and as we are not particularly concerned with the latter it will probably be better to leave this out of any consideration of the question and confine ourselves to the evaporation of water in the boiler. Here the efficiency is much greater and amounts to about 75 per cent.

Waste of Fuel

In an address made in 1918 by Van H. Manning, at that time Director of the Bureau of Mines, he stated: "Last year (1917) the United States mined 600 million tons of coal, the greatest production ever witnessed in the world, and of this amount we wasted 150 million tons, or 25 per cent. through inefficient use."

TABLE I. ANALYSIS AND CALORIFIC VALUE OF COALS

Coal	Moisture	Volatile combustible matter	Fixed carbon	Ash	Sulphur	B.t.u. per pound
Anthracite						
Pennsylvania	3.33	3.27	84.28	9.12	0.60	13,810
Colorado	2.70	3.32	88.15	5.83	0.80	14,490
Semi-bituminous						
Pocahontas (Va.)	0.65	18.80	75.92	4.63	0.57	15,190
Clearfield (Pa.)	0.76	22.52	71.82	3.99	0.91	14,950
Bituminous						
Clinchfield (Va.)	0.95	36.95	55.95	7.10	0.60	14,560
Connelsville (Pa.)	2.82	29.97	59.84	7.37	1.22	14,396
Lignite						
Wyoming	17.69	37.96	39.56	4.79	0.63	10,048
Texas	13.40	42.75	29.00	14.85	1.04	9,358

*Note. Compare this with Fig. 5, Part III, showing the relative value of various fuels based on efficiency, cost of preparation, etc.

TABLE II. RELATIVE COST OF FUELS

Coal			Natural gas		Oil	
14,000 B.t.u. per lb. Price per ton (2000 lb.) Dollars	13,000 B.t.u. per lb. Price per ton (2000 lb.) Dollars	12,000 B.t.u. per lb. Price per ton (2000 lb.) Dollars	1000 B.t.u. per cu. ft. Price per 1000 cu. ft. Cents	900 B.t.u. per cu. ft. Price per 1000 cu. ft. Cents	140,000 B.t.u. per gal. Price per gal. Cents	**B.t.u.** for one cent
1.00	0.93	0.86	3.57	3.21	½	280,000
1.50	1.39	1.29	5.36	4.82	¾	210,000
2.00	1.86	1.71	7.14	6.43	1	140,000
2.50	2.32	2.14	8.93	8.04	1¼	112,000
3.00	2.79	2.57	10.71	9.64	1½	93,333
3.50	3.25	3.00	12.50	11.25	1¾	80,000
4.00	3.71	3.43	14.28	12.86	2	70,000
4.50	4.18	3.86	16.07	14.46	2¼	62,222
5.00	4.64	4.29	17.85	16.07	2½	56,000
5.50	5.11	4.71	19.64	17.68	2¾	50,909
6.00	5.57	5.14	21.42	19.28	3	46,666
6.50	6.04	5.57	23.21	20.89	3¼	43,077
7.00	6.50	6.00	24.99	22.50	3½	40,000
8.00	7.43	6.86	28.56	25.71	4	35,000
9.00	8.36	7.71	32.13	28.93	4½	31,100
10.00	9.29	8.57	35.70	32.14	5	28,000
11.00	10.21	9.43	39.27	35.35	5½	25,454
12.00	11.14	10.28	42.48	38.57	6	23,333

The losses which occur in utilizing the heat of the coal in the evaporation of water are numerous, but they are chiefly from the following causes:

1. Heat carried out by the products of combustion.
2. Unconsumed coal carried out by the ashes.
3. Coal not completely burned to carbon dioxide.
4. The radiation of heat from the walls of the furnace, boiler, etc.

Table III shows the heat distribution met with in boiler practice and Fig. 2 illustrates this graphically, while Fig. 3 illustrates the same distribution in lime burning.

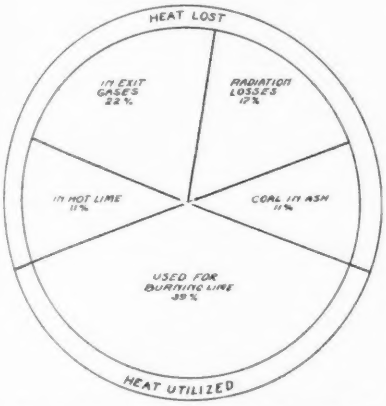


Fig. 3—Graphic representation of the average distribution of the calorific value of coal in a grate-fired lime kiln

In the case of any piece of equipment heated by a coal fire on a grate, such as is used with a lime kiln, a drier, or a reverberatory furnace, the losses of heat are from the same causes as with a boiler, so it will be sufficient for present purposes to consider the case of the latter.

The heat of coal is transferred to the water by burning the coal and then passing the products of combustion through or around the tubes of the boiler, etc. These products of combustion are gases at the temperature at which the boiler is operated. There is also some heat transferred by radiation. Manifestly as the heat is transferred from the products of combustion to the water in the boiler, the gases themselves are cooled and hence the temperature of the latter when they leave the boiler is an indication of the thoroughness with which this transfer has taken place.

(To be continued)

TABLE III. DISTRIBUTION OF THE CALORIFIC VALUE OF FUEL IN STEAM GENERATION

(Robert June, Combustion, December, 1920)

Heat utilized and lost	Highest attainable per cent	Good practice per cent	Average practice per cent
Heat absorbed by boiler	89.86	75.0	60.0
Loss due to heat in flue gases	5.33	13.0	20.0
Loss due to carbon monoxide	0.00	0.3	1.0
Loss due to unconsumed coal in ash	0.00	2.4	5.5
Losses due to moisture and combined water in coal	4.70	4.9	5.1
Radiation and other losses	0.11	4.4	8.4
Calorific value of fuel	100.00	100.0	100.0

Financial Editor on the U. S. Gypsum Co.

In answer to a question regarding the present status of the United States Gypsum Co., the financial editor of the Chicago *Journal of Commerce* states:

"The United States Gypsum Co. is the largest manufacturer of gypsum in the world. It was formed in 1901 by a consolidation of 35 companies producing gypsum. The company manufactures all classes of gypsum products, including hard plaster, cement plaster, prepared plaster, wood fibre and concrete plaster, and plaster blocks, finish, moulding and stucco.

"In addition to these standard products the company placed on the market 'Sheetrock,' a gypsum wall board which is well known and has been widely advertised. It will not warp and resists heat, cold and sound. It takes any decoration, either paper, paint or panels. The company owns deposits of gypsum rock estimated to contain between 130 and 150 million tons. It has about 40 plants and its properties are located throughout the United States, so that it can supply all markets at a minimum of freight rates. The management has been conservative in its dividends. No dividends on either its preferred or common stock were paid from 1906 to 1915.

"Preferred dividends were finally paid off in 1915; since that time preferred dividends have been paid regularly. In 1919, just 18 years after the formation of the company, dividends were started on the common stock at the rate of 4 per cent and have been continued to date. In 1920 and 1921 a stock dividend of 5 per cent was paid on the common and in 1922, 10 per cent. In 1920 the company was reorganized under Illinois laws. Five shares of the present common stock were given for each share of old stock. In the last nine years net earnings, after depreciation, interest ana taxes, have shown a consistent growth in almost every year, or from about a half million dollars in 1915 to more than $3,000,000 in 1922.

"Relatively a small proportion of these earnings have been paid out in cash dividends. The balance has been reinvested, which steadily increased the production and profit of the company. In 1918 the plant and properties of the company were valued at about $4,750,000. In 1918 net profits were about $659,823, while in 1922 they were more than $3,000,000. During that period $1,000,000 in gold notes have been paid off and a relatively small amount of notes payable, leaving the company with no debts except accounts payable as of December 31, 1922. In spite of this large increase of net profits there has been relatively little change in inventory or working capital. The large demand for building products throughout the country has enabled the company to work at almost full capacity.

"Earnings in 1922 were over $12 a share. Business fo. the first quarter of this year has bettered last year's record. The future looks good in spite of the curtailment of building over the country. This curtailment is likely to have a stabilizing effect and prevent a runaway market in the building trade.

"The management of the company has made such good use of the funds retained in the business that the market price of the stock has gradually appreciated over a period of years. Not taking into consideration whether this is the time to buy stocks in general or not, it would seem that gypsum was one of those few stocks that one is justified in putting away and forgetting, whether the general market may happen to be bearish or bullish."

United States Gypsum Co. has declared quarterly dividends of 1¾ per cent on the preferred stock and 1 per cent on the common stock, payable June 30 to stock of record June 15.

Searching for Nature's Secrets

How and When Shall We Duplicate Artificially Such Ideal Building Materials as Bermuda's Coral Rock?

ALL who recall the fundamental principles of Chemistry and Physics know that man never *creates* anything. Nature has provided it in some form or manner. We merely tear down and build up again, disintegrate and reassemble; but we always work with indestructible and uncreatable things, or elements.

Concrete, for instance, is a man-made "breccia"—a conglomerate rock of which there are many examples of Nature's own manufacture. And while concrete is a very useful imitation rock, is a mighty poor imitation of a rock compared with some of Nature's best.

Similarly, plaster is an artificial gypsum rock, or an artificial limestone, as the case may be, adulterated with sand or other material. But no plaster, nor mortar, can compare with the marble or limestones or alabaster that Nature has manufactured in abundant profusion.

Moreover, geologically speaking, Nature is all the time making these products right under our noses; yet we go stumbling along, forever blindly experimenting instead of making an intensive study of Nature's own methods; first to determine the exact proportions of ingredients and their functions, and then to try to duplicate results by quicker and better methods.

In the realm of organic chemistry, man by unraveling some of the previous mysteries of Nature can now make indigo and a thousand and one other useful products *synthetically,* or out of the pure principles, better than Nature herself ever did the job. The same possibilities exist in the field of geologic chemistry. When that time comes our present complicated and expensive methods of burning lime and cement and

Bermuda coral rock quarry showing how the rock is removed in sawn blocks

Winter home of a New England lady—a coral rock building 214 years old. Built by the first president of the Bermuda Co.

reconverting them into rock structures may seem crude indeed.

An Ideal Lime Building Block

The foregoing revery, or whatever you want to call it, is the result of knowing that the lime industry would be delighted to find a way of making commercially a light porous block or tile, like a gypsum or asbestos block or tile; and from a realization that Nature has made just such a material, which is widely used for building purposes on the island of Bermuda.

There Nature has made in recent geological times a chalky limestone or coral rock which is as light as gypsum, which can be cut when first quarried like cheese, which can be given any shape, and which, built into a wall, makes an ideal type of construction—insulating and fireproof.

This Bermuda coral rock hardens somewhat in air, but like gypsum, it cannot be exposed to the weather any great length of time without eventually disintegrating. Nevertheless, it is an ideal material to stucco over, and for interior partitions to plaster over. Thus covered it apparently will last indefinitely.

In Bermuda roofs are covered with slabs of this material. They are waterproofed with a paint coat of asphalt or tar and then whitewashed.

Since man has often demonstrated that what Nature can do by natural processes he can learn to do better, if he applies himself to the problem, we respectfully suggest that properly qualified geologic chemists be induced to apply some of their knowledge and skill to the problems of the lime and cement industries.

Sawing Bermuda coral rock into building blocks

"Quarrying" Bermuda coral rock—Copyright photo, Ewing Galloway

Road cut through coral rock

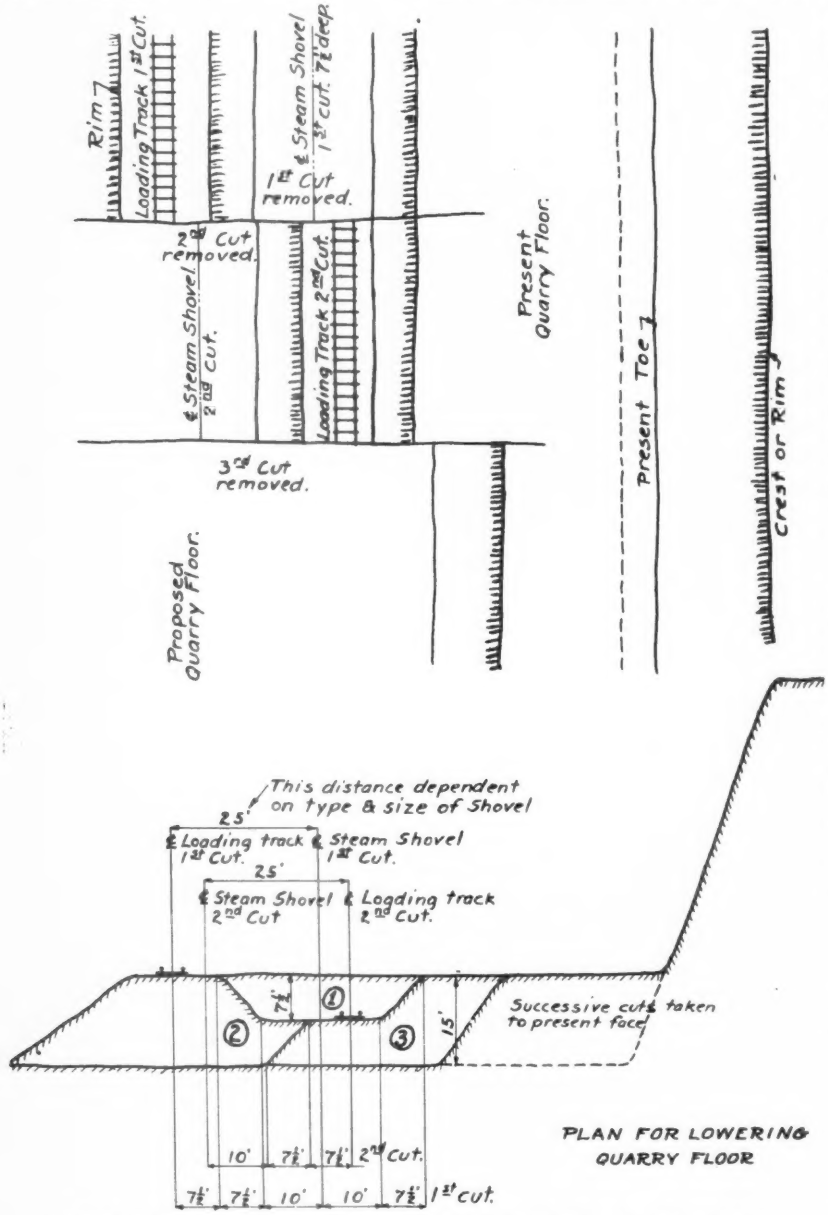
Lowering a Quarry Floor

New York Quarryman's Problem Answered by Experts

THE chief object of this compilation is to point out to quarrymen the wealth of expert knowledge and advice available to them, for the asking, from such well-known experts as those listed. It also serves to illustrate the value of the Associate Membership in the National Crushed Stone Association to both machinery and equipment manufacturers and quarry operators. There is every reason why the two branches of the quarry industry should fraternize and exchange experiences and through such interchange increase the efficiency of quarry operations.—The Editor.

A NEW YORK state quarry operator sent ROCK PRODUCTS' Research Department the following problem:

Given steam shovel, track, cars, well drill, tripod drills, hammer drills and a level quarry floor bottom, which we desire to lower 15 ft. We would like all the available data on best method of lowering the present floor to an additional depth of 15 ft. The matter of drainage for water will not enter as we have natural drainage to a creek at a level lower than the 15 ft. we desire to go. The principal facts wanted are method of drilling, spacing, loading of the holes, track arrangement, etc.



Plan for lowering quarry floor proposed by J. Barab, Hercules Powder Co.

Answers

J. Barab, explosives engineer, Hercules Powder Co., Wilmington, Del., says:

"In giving the above details two important points of information are not included, namely, the kind and size of steam shovel available and the nature of the formation. You must appreciate that both of these factors are very important in making a decision as to just how to perform the above operation. In the following information, therefore, I am assuming that a regular 95-ton steam shovel, with about a 30 ft. boom is available, and the formation is a limestone of medium hardness but solid.

"I am attaching two drawings, namely, "Blasting Diagram" and "Plan for Lowering Quarry Floor." I believe that two cuts of 7½ ft. each would be the most feasible for this depth of holes. Tripod drills would undoubtedly be the most economical, providing, of course, that holes can be sprung. The spacing as shown in the blasting diagram, assumes that practically all of the powder is loaded in the pockets. The holes should be drilled approximately 2 ft. below the grade desired to break. The holes spaced 8x8 ft. and 9 to 10 ft. deep should be loaded with about 15 to 20 lb. of powder per hole. The 17-ft. hole should be loaded with from 40 to 50 lb. of powder.

"I would suggest that 40 per cent L. F. Extra Dynamite be used for this purpose. However, the best selection of powder can only be made by being thoroughly familiar with the nature of the rock. The plan and drawing can be followed in the order given. That is, 1, 2, 3, would indicate the cuts taken in their proper order. These also show the track arrangements and how to continue lowering the entire quarry floor up to the present face.

"Of course, there are other methods which may be used in accomplishing this purpose, but I believe the above should be as satisfactory as any."

Brownell **McGrew**, engineer, Allis-Chalmers Mfg. Co., Chicago, Ill., also a quarry operator of experience, writes:

"The writer is slightly familiar with the layout in question. I do not know of any better suggestion to make than to refer them to the method used by the Consumers Co. at its Lemont quarry, which was recently described in ROCK PRODUCTS (December 30, 1922, p. 85), disregarding, of course, the provisions for drainage. The writer has personally inspected the work at Lemont and was very much impressed with it. I would therefore suggest that you recommend this method to your inquirer."

S. R. Russell, technical representative of E. I. Du Pont de Nemours & Co., Wilmington, Del., writes:

"There are at least two methods which might be used to successfully accomplish the purpose desired, which I will call Method A and Method B. It would be well to begin sinking near the foot of the present incline, but far enough so as not to interfere with the quarry cars going and coming from the present working face.

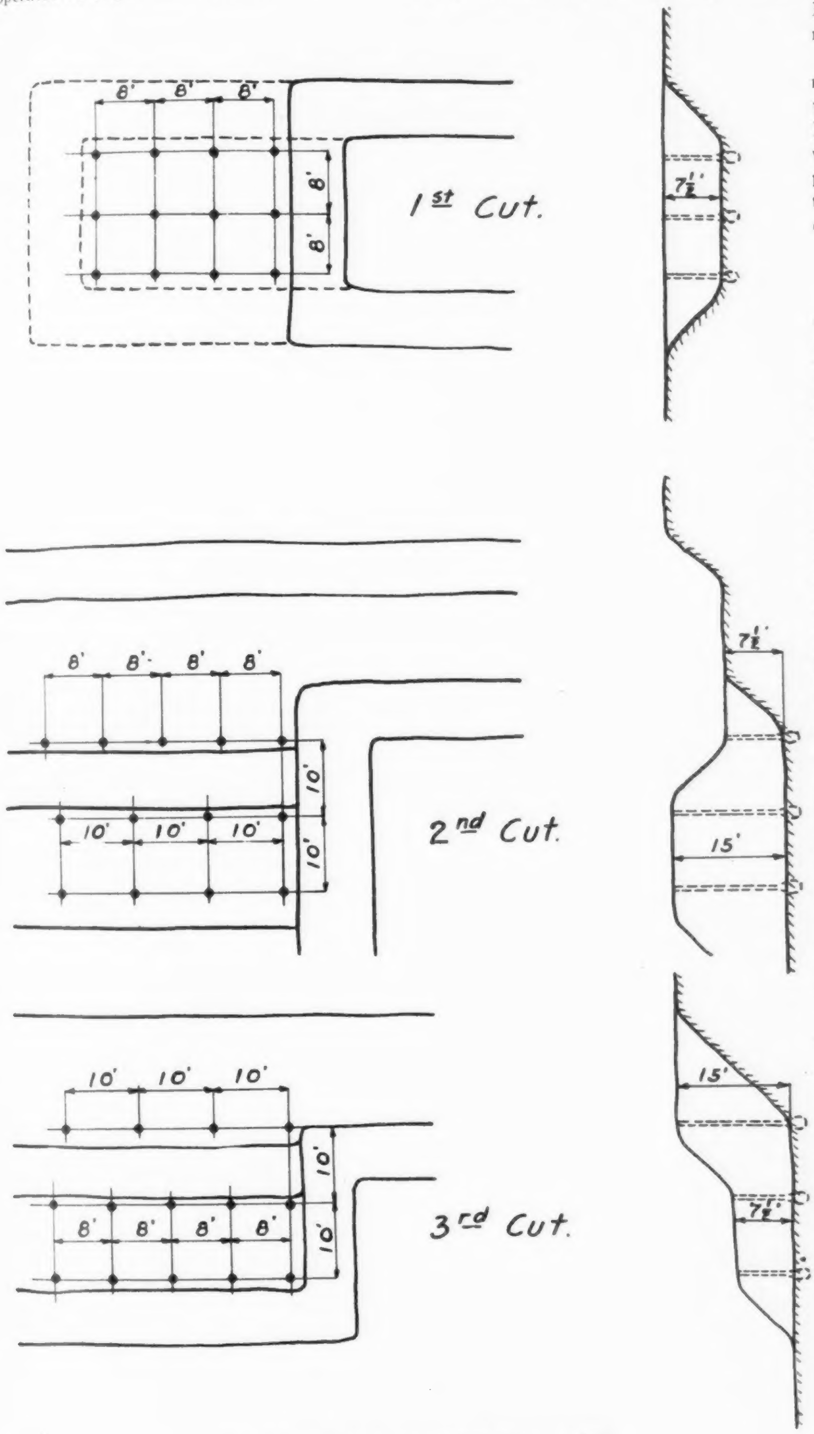
Method A

"A battery of well drill holes could be drilled, spaced 9x9 ft., and to a depth from 3 to 5 ft. below the desired grade. These holes should be arranged in staggered order and the first shot should be, say, five holes wide and as long as desired. Could suggest for the 'breaking in' shot that at least 30 holes be drilled and blasted; that is, five holes wide and six holes longitudinally. I would recommend that 60 per cent gelatin be used for such work and about 75 lb. be loaded per hole. The broken rock can be loaded out with a shovel and the cars dropped down alongside or behind the shovel from an extension of the present incline and the full depth of the new face carried almost immediately—at least, as soon as the shovel can be righted to a horizontal position.

If such an arrangement would interfere too much with the operation of the regular quarry cars up and down the present incline, an opening could be made farther away from the foot and the cars lifted out by a temporary hoisting engine erected on the quarry floor. Sometimes, when breaking-in shots are made in this way, the stone is removed by means of a clamshell bucket and loaded into cars on the quarry floor, especially until sufficient area is obtained at the bottom to present a working face for a shovel or for some loading tracks.

Method B

"This method is commonly used in making thorough cuts on railroad work and is known as the bench or step-down method. Tripod drills are usually employed, although well drills could be used, except with the tripod drills a closer spacing would be necessary. I believe that the use of tripod drills would probably be more economical. A battery of holes, say, six wide and as long as desired, should be drilled, spaced approximately 6x6 ft. and at least 18 ft. in depth. These holes also should be staggered. It would be well to spring these holes at least twice before loading the final charge. Holes should be loaded



BLASTING DIAGRAM FOR LOWERING QUARRY FLOOR

Blasting diagram proposed by J. Barab, Hercules Powder Co.

about half their depth with 60 per cent gelatin. By this method the quarry cars can be run on the present quarry floor alongside of the blasted rock. A smaller type shovel, as a rule, can only load about 10 ft. above the base of the rail on which it rests, so considering the height of the quarry car, possibly only about half the cut can be loaded out on the first run-through of the shovel.

"After the shovel has made its first cut, then the solid bank adjacent can be drilled to full depth as before and as wide as desired. The shovel can then be moved over and dig the full depth of the holes and the tracks for the quarry cars should be placed down on the level just excavated by the shovel. After the shovel has made the second cut through, the tracks can then be placed on the final grade and the shovel can clean up by digging the bottom of the first shot. Thus, by interchanging the shovel and the tracks, working one side and then the other, the rock can be removed to final grade. After this the cut can be extended laterally or longitudinally as desired.

"This method is probably more widely used than the other and offers less interference with the other operations of the quarry, and, in my opinion, would be the best one to pursue."

M. B. Garber, of the Sanderson-Cyclone Drill Co., Orrville, Ohio, writes:

"In order to give very definite recommendations on this particular problem, there really should be more information concerning the quarry and conditions as to the kind of rock; if limestone, the nature of the stratification, whether thick or thin and also whether the quarry is a pit quarry or a hillside quarry.

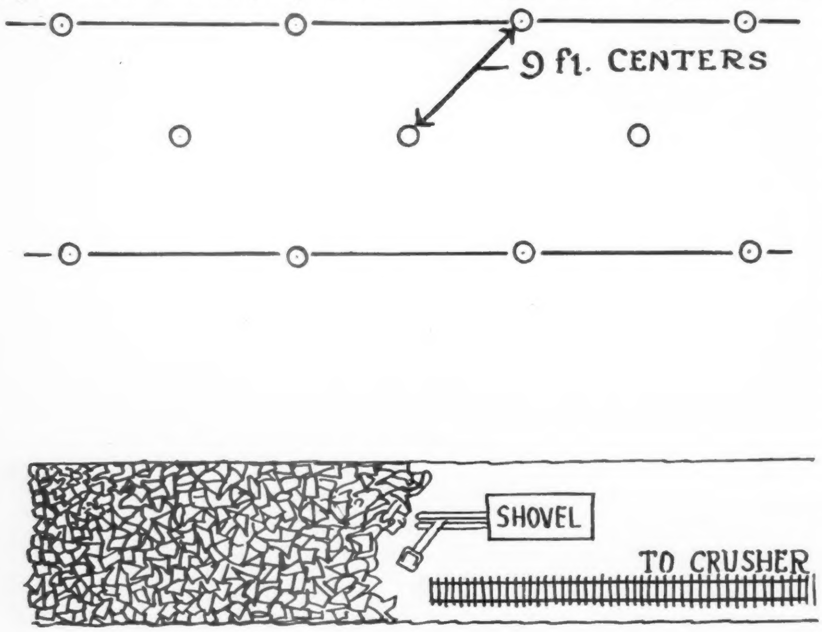
"From the way the information you have given us reads, it would seem to indicate that it is a pit quarry, inasmuch as there would be no particular difficulty in lowering the working face of a hillside quarry where there would undoubtedly be a natural working face to start from.

"All things considered, the quickest way, and undoubtedly the most economical way, to lower the quarry floor would be with well drills and taking what is known as a lift; several rows of holes to be drilled the full length of the working floor, the holes staggered or zigzagged and spaced on approximately 9-ft. centers. If there is no natural seam at the bottom of the 15-ft. lift the holes should be drilled about 2½ ft. below grade or, in other words, instead of drilling the holes exactly 15 ft., they should be drilled about 17½ ft. so that the new floor will be lifted and there will be no danger of toe developing.

"The exact amount of explosive per drill hole would again depend on the character of the rock but approximately 50 lb. of 40 per cent dynamite in a 5⅝-in. hole, if the limestone is of ordinary hardness, will make a very nice lift.

"After the shot is made, it will be necessary to work the shovel into the lift, starting to load the stone at that point of the lift that is closest to the crusher. Once the shovel is on the bottom of the lift of a new cut the tracks can be laid to follow the shovel as it loads.

"We are including a sketch, giving you an approximate idea of how to proceed. However, we would be very glad indeed to furnish more accurate information if the crushed stone company would care to draw up a plan and cross-section of its quarry as it might be that some other method of procedure should be followed."



Plan proposed by M. B. Garber, Sanderson-Cyclone Drill Co.

W. O. Dunn, district manager of the Grasselli Powder Co., Cleveland, Ohio, writes:

"The information regarding equipment at this quarry and the problem in general is not complete enough for one to cover the subject thoroughly as there would be so many local conditions entering into the question that would really have to be worked out by someone on the ground. We would suggest the following system:

"Open a through cut to the required depth entirely across the quarry floor. As to whether this should run parallel with and close to the face, or at a point farther from the face, or at right angles to the face, would be governed by the size and shape of the quarry floor and the position of haulage tracks to the crusher plant.

"In regard to the drilling and shooting, would suggest that holes be drilled with a well drill, laying out four rows of holes spaced 8 ft. apart each way, and placed so that the crosslines of holes will be staggered, and drilled to a depth of 17 ft., or 2 ft. below the point at which you wish to make the quarry floor, unless this would take you down into material you do not want mixed with your rock, in which case you would have to stop at 15 ft., where there would no doubt be a seam or cleavage to break to.

"The holes I would charge with 40 per cent N.G. dynamite, using approximately 50 lb. to the hole, placing about 40 lb. in the bottom and 8 or 10 lb. at a point 5 ft. from the top, which would be a double charge in the hole with tamping between. However, the position of this second charge would depend on the strata of the rock and should be decided by the men on the ground.

"This may seem like a heavy charge for this depth of hole, but it is necessary to crush and shatter the entire block of rock as there is no movement for the material except upward. It would be advisable that 10 holes in each line, 40 holes in all, be fired at one time so that the system of loading, or even drilling, can be changed for the next shot if necessary. Place the loading tracks along one side of the cut, starting the shovel in one end, working down to a depth of about 8 ft., which is about as low as you can drop the shovel and still load a dump car on the level. After going through the entire cut with this lift, back the shovel up and in working down on the next cut go to the bottom, having placed your loading tracks on the grade of the first cut excavated by the shovel.

"The grade made by the shovel in going down this second cut could be made your permanent haulage grade, coming up from the quarry floor to the haulage tracks leading to crusher The grade should be kept at a suitable incline and, if possible, the entire cut started at a point that would bring it down to the quarry floor at the most suitable place. On this cut you will be taking

the entire lift of 15 ft., after which the shovel can be backed up to the foot of the grade, where it started in, and then worked over into the rock for the third cut, your loading tracks then being down on the bottom. After sufficient room has been made, the shovel can be moved over to the other side, picking up the rock underneath this first cut. This will give you two working faces in the cut if so desired and practical.

"As stated in the beginning, there are so many local conditions entering into this problem, that this method may not appear to cover your proposition. For instance, if you are using a small-type shovel that does not have a lift of dipper, it may be necessary to work down in three lifts instead of two. This and other details can be worked out by the men on the ground who are familiar with the local conditions."

The Lime Industry as Practiced in China

By W. H. Chou
Sales Manager of the Ta Hu Cement Co., Wusieh, China

THE lime industry in China is widely spread throughout all provinces and areas, but exact data showing the annual production and consumption are, however, rarely obtainable. In the suburb of Peking and Taiyuan district of Shansi, a little information regarding this branch of industry is obtained, and given in the following account:

Chowkiatien, Wanfotang, Tahuich'ang, Mentoukow and Huiku in the immediate neighborhood of Peking are the better known regions of lime production, much of which is used for roadmaking. Limestone thus obtained, quarried in the hills, is mostly dark gray in color with occasional light colored beds, and, in some layers, with characteristic white or reddish streaks, parallel to the stratification. In fact, it is the upper Sinian limestone of the Ordovician age.

Within a radius of about 1 li of Chowkiatien station the limestone thus quarried is chiefly used for lime-burning. Coal, mixed with some clay and moistened, is spread over the limestone layers of the kiln with spaces left between the limestone for air passages. The quantity of coal needed for burning purpose amounts to one-third or one-half of the weight of the limestone.

In this region as well as other regions, no permanent ovens are built and used. Field kilns are mostly adopted. They are built cylindrical in shape, about 20 ft. in diameter and 17 ft. in height, with more or less rounded conical tops. At their bottoms, firewood is used. They are built with limestone and layers of coal one above the other. In the course of construction, the fire proceeds upward. On the outside they are tied with thick ropes in order to prevent them from collapsing. Here as many as 109 kilns of this character are reported in existence. They are generally grouped in from five to eight lots at different quarries. About 600 men are employed in the lime-burning trade, and their daily earnings vary from 20 coppers in winter to 30 coppers in summer. The lime is sold at a price of about 18 coppers per 100 catties at the kilns. When it is transported to Peking, it is worth about 20 coppers per 100 catties. The production of this particular region is mostly for Peking, Tientsin and Paoting.

At Wanfot'ang there are about 85 kilns. The center of distribution is Toli, and the produce is usually sold at the kiln for 90 cents per 1000 catties. When it is transported to Toli, the price of the same quantity is about $1.45.

At Tahuich'ang, Mentoukow and Huiku a considerable quantity is also produced. Prices at the kilns are practically the same as those mentioned, but they vary greatly as the lime is shipped to centers of distribution or places of consumption. The following figures show the production of lime in tons from 1915 to 1919 at Chowkiatien:

	1915	1916	1917	1918	(½ yr.) 1919
Lime	126,153	125,595	134,501	95,960	48,757

The tonnage of lime produced in Sankiatien is shown as follows:

1915	1916	1917	1918	(½ yr.) 1919
3,290	2,164	2,835	13,406	21,236

(Note—All figures in tons.)

In the district of Taiyuan, Shansi, the industry, in some respects, assumes considerable proportions. The method adopted for burning the limestone is almost similar to that used in the region of Peking, but the size of the so-called field kilns is slightly modified. The diameter of the kilns in this district is about 5 ft. with a height varying from 3 to 4 ft. The burning process usually lasts for six days without interruption. The kilns are seven in all. Their yearly output:

Name of kiln	Owner	Yearly output catties
Sin Tai	Kou Chin-hai	150,000
Ta Chen	Chu Hei-tze	120,000
Chuan Shen	Kao San-mao	160,000
Hsin Shen	Wu Yao	130,000
San Ho	Liang Wen-kao	120,000
Wan Shen	Chang Chen	170,000
Teh Shen	Chang Erh-mao	150,000

Considerable quantities of limestone are burned in Shantung province, particularly at Tsinanfu.

Standardization of Quarry Cars

QUARRY cars are of many different types and sizes, states Oliver Bowles, mineral technologist of the Department of the Interior, in Serial 2454, recently issued by the Bureau of Mines. For hand loading, 2- to 2½-ton cars seem to be the most used. For steam-shovel loading larger cars are preferred. Side dump cars are the most common, though end-dump cars are used at some quarries. Both wooden and sheet metal top cars are used and each type has its advocates. The metal top is in general more durable than wood, but is more difficult to repair. Where steam shovels are used metal tops are bent with heavy rock masses, and it is difficult to straighten them. On this account some operators prefer the wooden tops that may be easily and quickly repaired in the quarry shops.

Some quarry cars for heavy steam-shovel work are made of steel plate, an oak cushion over the plate, and a light steel cover plate protecting the wood. The top plate allows a smooth sliding surface for discharging the load, while the wooden cushion protects the main body plate. The light plate and wood are bolted to the body plate, and thus may be easily replaced when worn out.

Cars for steam-shovel loading should be strong and durable, for they are of necessity subjected to much rougher usage than those loaded by hand. Cars for hand loading should be low to save loaders the laborious task of lifting the rock unnecessarily high above the ground.

There is need of better standardization of quarry cars. The demands are so variable that most car manufacturers cannot keep cars in stock. If quarry operators would establish a few standard types and sizes that could be kept in stock, orders could be more quickly filled; also through the advantage of constructing cars with more completely standardized parts, the cost could probably be reduced.

It is important that an adequate supply of cars be provided. If a small number of cars is available any unusual delay in disposing of loaded cars may keep quarry loaders or loading equipment in idleness, and, on the other hand, delay in loading may soon retard following operations if there is no reserve supply of loaded cars.

Manitowoc Cement Plant Work Starts

THE site has already been purchased and the work of constructing the new cement plant at Manitowoc, Wis., will begin at once, we are reliably informed. J. B. John, vice-president of the Newago and Petoskey portland cement companies and consulting expert for the Sandusky Cement Co. in its new plant near Toledo, Ohio, is in charge of construction of the new plant. It will be designed along similar lines to the plants at Petoskey and Toledo. Stone will be brought across Lake Michigan from the Newago company's quarry.

The Design of Sand Plants

By Edmund Shaw
Consulting Engineer, Chicago, Ill.

Part II, No. 2—Laying Out the Plant with Reference to the Trade to Be Served. Various Methods of Loading Trucks from a Drainage Pile

IN CONSIDERING the layout of a straight sand plant, the loading facilities will determine it largely, and these will depend on the kind of trade that is to be served.

The simplest plant in this respect is one that does only a wholesale trade and loads directly into cars. Usually, such plants are started without storage facilities, but it is found that these have to be added as trade increases. A plant having a trucking trade needs a storage yard, for it is not practical to fill trucks directly from the spout of a settling tank. Even if they can be filled in that way, objection is always made to have dripping loads of sand hauled over the streets of a city, or even over country highways.

The writer has seen a road that was made dangerous by hauling over it truck loads of material that was not too well washed. The wet clay that fell from the load formed a greasy coating on the paving that caused skidding unless it was driven over carefully. A plant that serves both a car trade and a trucking trade usually loads directly into cars from the spouts of the settling tank and into trucks from a storage yard which is filled from the settling box when there are no cars to be loaded.

Most sand plants are to be found beside a lake or river. (The lake may be an artificial pond made by the pump.) Almost anywhere in the United States that there is a river which may be dredged for sand, there is a railroad on one or both banks, and the plant will be situated beside the track. Usually there may be found room enough to parallel the main line with the loading track, but sometimes it is necessary to choose the situation carefully and to use considerable ingenuity to put in all the plant units without crowding them too much.

A typical river-side plant is shown in Fig. 3, showing the main line track, the loading track and the washing and settling plant. The loading track may be graded if the natural grade is not sufficient, so that the empty cars move by gravity through the loading point to the loaded storage track.

Use of a Car Puller

In some plants gravity alone is used to move the cars; in others, a mechanical car puller is employed. The choice is determined somewhat by the capacity that is required. If not more than 15 or 20 cars a day are to be moved, gravity may be depended upon, as the loss of a few minutes occasionally in changing cars is not a serious matter; but when more than 20 cars a day are to be loaded the use of a car puller is almost imperative. The empty car needs to be put in place as soon as possible, and if there is a little sand or ice on the track so that the pinch-bar has to be used for more than the starting of the car, considerable time is wasted.

Fig. 1—Guyed derrick for building stockpile at sand plant

Some operators contend that a car puller will pay for itself in plants which produce less than 20 cars a day. They point out that the grade that is sufficient with one condition of the rail is not sufficient for another condition, and that if the grade is enough to start the loaded car easily under all conditions, there is danger of it running away. But it may be noted in this connection that railroad men handle thousands of cars daily by gravity, in yards which are provided with "humps" in all sorts of weather, and with all sorts of rail conditions.

For straight car-loading with sand, directly from the spout of the settling tank, no further arrangements need be made than those required to handle the cars in and out of the loading point. But there must be good drainage to take care of the car drips. A concrete-lined ditch at each side of the track with a connecting culvert is the ordinary method of securing it.

A pipe leading from the overflow, either with or without a hose connection, is handy to wash away and sand that may be spilled on the track.

Loading Into Trucks

Loading the drained sand into trucks, for retail trade, is not so simple a matter as car loading, and there are a variety of methods in use. A few which the writer has noted are:

1. Draining in a bin and loading from a bottom discharge gate, or from a side gate and chute.
2. Stacking in yard and loading with a portable wagon loader or portable belt conveyor.
3. Loading from a yard with a light crane with caterpillar tread directly into the truck.
4. Loading from the yard into a loading hopper, either portable or stationary, the trucks taking their loads from the hopper through gates. The standard locomotive crane in generally used to load the hopper.

The writer's observation is that the first method of draining in a bin is not very satisfactory. A bin of any capacity, say, from 500 to 1000 yd., is somewhat expensive to build to begin with. Sand does not run like gravel when the bottom gate is opened. It will stand up so that only a straight-sided hole forms above the open gate, and it is necessary to do considerable shoveling, especially after the bin gets low. The gates are always dripping, and this makes the loading an uncomfortable job, especially in cold weather. But it is probably cheaper than any other method so far as operating cost is concerned.

Stacking in a yard and loading with a wagon loader is a method that is growing in favor. While it is not a new machine, the wagon loader is constantly being improved, and there is room for considerable improvement yet. It does not stand up well under constant service, which makes

the maintenance cost high, and, what is of more importance, a lot of time is wasted while the loader is being repaired. Sand is something that is usually wanted in a hurry, and there is nothing that builds up a retail trade in sand like a reputation for prompt service. So the operator has a "bad hour" before him when the loader breaks down and a dozen or more trucks are standing in line waiting to be loaded.

Quite recently the writer asked the representative of one of the large machinery houses if it was not possible to make a loader that would stand up under heavy and continuous service. He replied that it was, but that at present the demand would not justify the making of such a machine, as it would have to sell for a higher price than the ordinary man was willing to pay. He figured that it would cost about $2000 more than the best of the standard machines.

Aside from the high maintenance costs, the loader is a very satisfactory machine indeed. And in working in damp sand it is to be noted that it meets the severest of working conditions. The damp sand sticks to the chains and the sides of the buckets and is carried into bearings and gears so that they cut out rapidly. Then the stuff is not easy to dig. Sand which is run into a pile with water is compacted to a considerable degree. It will be found to occupy less space to the amount of 10 per cent or so than sand which is run into a pile dry. And it has a habit of standing up and then falling down on to the buckets in heavy masses.

A standard loader of this type is rated at 45 cu. ft. per minute, but it will do more working in damp sand where the sand will pile up in the buckets. The writer timed one of these loaders and it loaded five 4-yd. trucks and one 2-yd. truck in 13 minutes, including the time taken for changing trucks. The yard was arranged so that but little time was lost in changing, as the empty truck drove in behind the full truck and the operation of the loader was almost continuous. The average daily service of this particular loader is from 400 to 450 yd. per day.

In small operations the place of the wagon loader is sometimes taken by a portable belt conveyor. This machine cannot dig as the loader does, but it has certain advantages of its own, one of them being the low first cost. If it is kept close to the bank, the shoveling does not amount to much; about all that is required is to keep the sand flowing on the belt. The wheels may be set crosswise to the belt, so that the belt may be pushed around the arc of a circle, the center of which is the truck that is being loaded.

These portable conveyors may be run in series and in that way they can work over a considerable area. They are light, and if the ground under the stockpile is soft, it is better to use them in series than to cut up the ground by driving trucks over it.

As the portable conveyor has the same capacity as the wagon loader, the two may be used in combination. This has been done in one plant in which the writer knows. The only reason for using this combination would seem to be that for using two conveyors in series; that it avoids driving the trucks over the soft ground. For working on soft ground the wagon loader may be provided with caterpillar traction.

Fig. 2—Wagon loader for loading trucks for retail trade

The Crane May be Called the Standard Machine

The locomotive crane may be called the standard machine for handling material in and out of stockpiles, and most of the truck loading is done by means of this machine. For use in soft ground it is provided with caterpillar traction, but the larger sizes have such a wide radius of action that they can run on rails beside the pile and reach out into the pile. One sees more machines with 50-ft. booms than those with booms of greater length, although the 70-ft. boom is in quite common use. The 70-ft. boom machine will handle a 1-yd. bucket at the greatest radius at which the machine can work without using the stability rails, which have to be used with a bucket of a larger size.

In handling sand the type of bucket used is important, since the bucket does not have to be so heavy and so substantially constructed as for handling crushed rock. It should be wider than the standard bucket to pick up a full load in the parts of the pile where the sand is thin. Special buckets are made for this work. The 1¼-yd. bucket of this special type weighs no more than the 1-yd. bucket of

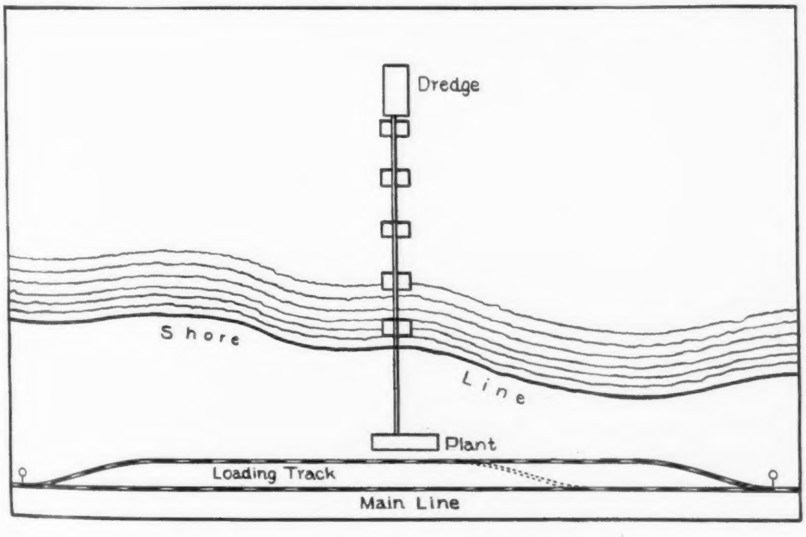


Fig. 3—Layout of typical river sand dredging plant

the standard type, and it will pick up its full load from a part of the pile where the standard bucket would not fill itself more than three-quarters full.

Trucks are sometimes loaded directly with the larger sizes of locomotive cranes, but the truck body is rather a small mark to hit with the contents of a yard bucket. The smaller sizes, with ½ or ¾-yd. buckets, can load into trucks directly and with short booms they are faster than a wagon loader, besides covering a greater radius without moving. It may be considered the next machine to the wagon loader in a series.

For the smallest operations—a portable belt conveyor will do—for increased capacity a wagon loader may be used, and when the operation is too large for the loader a small crane should be bought. For the largest operations a full-sized crane should be employed.

The larger size of cranes is often used to load directly into trucks, but the operation is easier and more satisfactory if a hopper is used. This makes the crane independent of the trucks to a great extent. It can fill up the hopper and go at other work for a few minutes, if this becomes necessary, and it is easier to hit than a truck body. If the hopper is large enough, the full circle may be swung with the boom, which is the fastest method of operating a crane. Both portable and stationary hoppers are used for truck loading.

Storage Systems

Few straight sand plants have any elaborate system of storage, such as is found with the larger sand and gravel plants and crushed-stone plants. What has been said about loading trucks from storage applies especially to the plants in which storage is filled into and taken out of all the time. "Drainage yards" would be a better name than storage yards, as their principal function is to drain the sand.

But every plant eventually has to have some actual storage capacity to keep up with the demands of its trade. The usual method of providing this is merely to increase the drainage yard, or to start a stockpile in another place. By far the most used method of building such a pile is that which employs a locomotive crane and a standard railroad car. The crane fills the car and pushes it to the stockpile and then unloads it.

Other methods which are employed are the use of a boom derrick, set in the center of the storage space, and the use of the cableway dragline. One manufacturer advocates strongly the use of a drag bucket, both for building storage and for reclaiming sand.

(To be continued)

Mining, Washing and Loading Sand Hydraulically

The Atlanta Sand and Supply Co., Atlanta Ga., Operates Pits at Galliard and Rollo, Ga., at both of Which the Hydraulicking Method Is Employed. The Same Water Used in Digging the Material Is Used to Convey, Wash and Load It Direct Into Cars for Shipment

THERE are few sand operations where the contour of the land permits the employing of hyraulicking methods in digging the material, for at most operations the deposits are below the plant level, making it necessary to use one of three standard methods—dredging, dragline, and steam shovel and cars. It is a conservative estimate to say that 98 per cent of the sand and gravel operations in this country use one of the three mentioned methods in their various forms. The remaining 2 per cent includes those using hydraulic and other systems.

Of these operations, three are in southern Georgia. One of them is a plant of small production, operating hydraulically only in part. The sand is excavated by water-power and sluiced to a sump. There it is picked up by a chain-bucket elevator which empties into a wooden sluice leading to the car-loading point. The only washing done in the entire operation is when the material is passed over a ⅜-in. woven-wire screen. The product of the screen is loaded direct into cars. To persons who do not know the definition of "clean and graded sand," however, the material produced at this operation appears to be of an excellent quality, although in reality it is of the same quality as that remaining in the deposit.

The other two operations are at Galliard and Rollo, Ga., and are owned and operated by the Atlanta Sand and Supply Co. of Atlanta. These operations are practically identical—the only difference being that the Galliard property is further developed than that at Rollo. Both are located on one 900-acre tract, practically all of which is underlaid with a deposit of white silica sand, ranging from 10 to 26 ft. in depth. The land, while not hilly, is rolling, making it ideal for the application of the hydraulic method of mining.

Practically no equipment is required in the production of sand at these operations. In fact, none whatever is used exclusive of a pump, pipe lines and nozzles. The water is obtained from a small stream running through the property and as it is used it is sluiced to a settling pond. From there it overflows into the creek above the suction and consequently is used over

Digging sand hydraulically. The sluice box is laid underneath the pipe line

The flume discharges on this 3x6-ft. section of ¼-in. woven wire screen

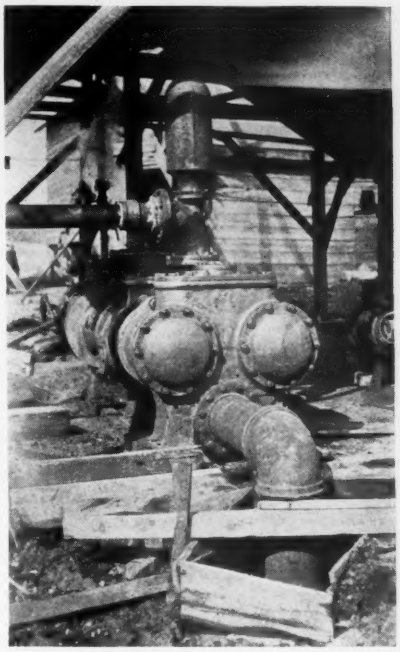
again. The pump is a big 20x12x12-in. Worthington duplex with a 10-in. suction and 8-in. discharge. Steam for this unit is furnished by a 150-hp. Ames horizontal boiler in which wood is used for fuel.

A. P. Burke, president and general manager

This machine pumps under a 150-ft. head through approximately 2000 ft. of pipe delivering at the nozzle 10,000 c.p.m. The nozzle is 1½-in., affording a pressure of 125 lb. As shown in one of the illustrations, the nozzles are mounted from 15 to 25 ft. from the bank and two 2-in. planks are laid on edge from the nozzle, forming a V, the points of which are toward the bank. These serve as wells and divert the water sand and toward the sluice-box. All of the sluice-boxes are laid on the ground and the pipe lines are mounted over them on wooden supports, using the boxes as foundations.

At a point 25 ft. from the loading track and 10 ft. above it, the sluiceway runs at grade, and at a point 10 ft. from the track it runs up-grade. There is provided a flat woven-wire screen of ¼-in. openings, which retains all rubbish, such as twigs, leaves and pebbles as well as clay balls. Here a man is stationed whose duty it is to keep the screen clear of foreign matter and load it into wheel barrows in which it is hauled to a dump. In this way nothing larger than 3/16-in. sand is produced.

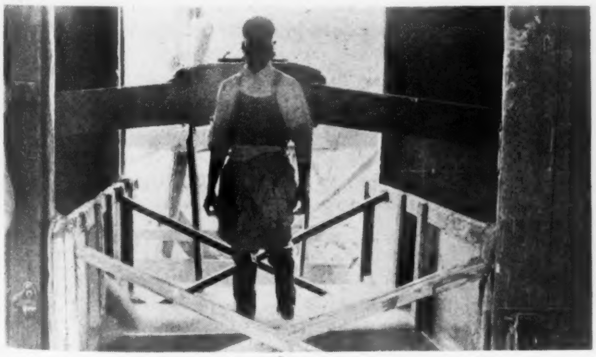
This, however, is not the extent of the cleaning process. The sand and water passing through the screen enter a second flume mounted between the screen and the loading track. At this point the sluice box is hinged so that it can be lowered to clear a passing box car. When a car is spotted, the sluice box is put up in place in such a position that its end is in the center of the car. At the end of the flume two additional sluice boxes are hung, one extending to either end of the car. Thus,



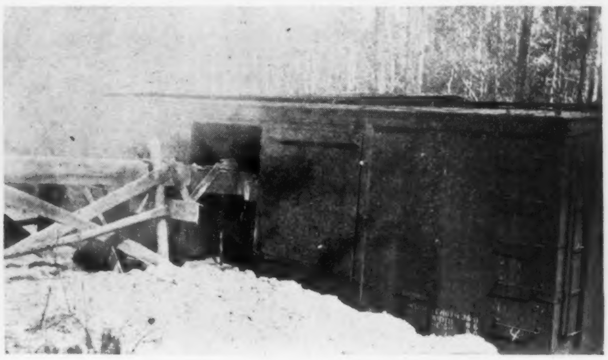
This 20x12x12-in. pump furnishes 1000 g.p.m. The pump and boiler are the only pieces of mechanical equipment used

the product of the screen is divided, half of it going to one end of the car, the other half to the opposite end.

It is here that the sand receives its final washing. Each end of the car is closed up with a door similar to a grain-door, being about 30 in. high and reaching across the car from one door to the other. These are held in place by 2x4-in. timbers, two to each door, serving as braces. In the cen-



Each end of the car is converted into a box-type settling tank. The openings in the gates are 14 in. wide



The sluice box is hinged so that it can be raised or lowered to go into a box car

This happy bunch of boys, together with the foreman, nozzlemen and firemen, keeps the operation moving—to the tune of 20 cars per day

ter of each of the improvised doors is an opening extending to within 4 in. of the top. This opening is about 14 in. wide, and is used for the drainage of the water and light foreign materials. As the car fills up 2-in. slats are inserted to hold back the sand. In other words, the system works on the same principle as a box-type settling tank. When the cars have been filled and allowed to drain, the adjustable gates are removed and the doors closed and then the sand is ready to be moved to its destination.

This method of operation at this company's plants is entirely satisfactory and the product receives the approval of all contractors and engineers in that section. However, such a system would no doubt

Interior of a loaded car. The ray of sunlight reveals the material's white ness

be unsatisfactory if applied to an average piece of property. It is not probable that the foreign matter found in sand taken from the average pit could be removed in this way. The system works successfully at the Atlanta company's operations only because the sand is as near perfect as possible before it is taken from the bank. Unless one is familiar with it, it is difficult to distinguish between a washed and an unwashed sample. That there is some dirt in it, however, is proved by the waste water passing to the settling pond.

Two distinct grades are produced, but not in one operation. One is a fine grade which is sold for masonry and traction purposes. This grade underlies a deposit of coarse, sharp-grained sand and each is mined separately as required. The system of sluice boxes is arranged so that one flume extends from the fine-sand deposit independently of the one from the other deposit, both leading to the same screen.

Each of the plants have a daily output of 20 cars, requiring in all but nine men—one at the boiler, one at the nozzle, two at the screen, four for loading cars, and a foreman. With negro labor at approximately half the price paid in the East and North, it is easy to realize the low cost of production.

A. P. Burke, the president and general manager of the Atlanta Sand and Supply Co., is a man well known to the sand and gravel industry of the United States. Mr. Burke served as chairman of the Executive Committee of the National Sand and Gravel Association in 1921 and his company has been a member of that organization since 1919. He was one of the leaders in the organization of the Southeastern Association of Aggregate Producers early this year and was elected its first president. Mr. Burke is recognized as one of the most aggressive sand and gravel men of the South.

This crane is used to excavate for the new railway racks which will afford operation of a lower level

Color Effects in Slate

SLATES differ in color, the preference being based more on tradition than on artistic taste or actual qualities of the slates, states Oliver Bowles, mineral technologist of the Bureau of Mines, who has completed a study of the technology of slate for the Department of the Interior. A wider market for colors not now in demand depends therefore on the cultivation of public taste, states Dr. Bowles. Architects and builders can widen the field of utilization of roofing slate by judicious efforts to popularize new colors or combinations of colors.

Slates are classed as fading or unfading according to their color stability. The fading of green slates is probably due to the presence of iron carbonate which seems to be present not as pure siderite, but as an isomorphous mixture of the carbonates of iron, lime, magnesium and possibly manganese. The hydrous iron oxide formed by decomposition of the carbonate through action of certain solvents carried in rain water destroys the green color and causes fading. The black and gray slates usually contain small amounts of such constituents and are therefore nearly permanent in color. Bluish slates commonly turn grayish, and red slates may turn brown.

A moderate and uniform fading may not be detrimental, but may produce a more pleasing effect, though in replacing broken slates it may be difficult or impossible to match the colors.

Spots and blotches are very objectionable in slates. Many of the red and purple slates contain pale green spots, some bordered with purple. The spots range in size from minute specks to spots 2 in. or more across; some are circular or oval and others are irregular. In places the spots form bands or ribbons. It appears that the pale green spots in the red and purple slates are due to chemical changes caused by the decay of organisms embedded in the clays from which the slates were formed.

Keen Interest in Coming of Immigrants*

Employers Arranging to Get Their Share of Men Arriving in New Fiscal Year—Steel Manufacturers Developing Other Sources of Supply

By L. W. Moffett

WASHINGTON, May 28.—Complaints of labor shortage in the iron and steel and allied industries, as well as in other basic lines and agriculture, have greatly increased interest in the immigration movement that sets in with the new fiscal year beginning July 1. Reports coming to officials in Washington indicate that large employing interests are preparing to take advantage of the movement and will have offices and agents at ports of debarkation for the purpose of recruiting as much labor as possible. It already is the practice of a number of industrial lines to obtain labor by this means and also by maintaining agencies in industrial centers.

Because the immigration movement is now so restricted, a great part of the work of getting employes in the iron and steel industry has been associated with the migration movement of negroes and Mexicans from the South and Southwest to the North. While this has been a source of some relief, iron and steel manufacturers have made known to government officials their conviction that this class of labor never will acquire the efficiency of the typical steel mill laborer, such as the Slav. The statement has been made by an important iron and steel manufacturer that, rating the Slav at 100 per cent efficiency, the average colored worker in Northern steel mills would be rated at 80 per cent, while a considerably lower rating is given the Mexican laborer. Looked at from a point of loss of tonnage, it maintained that the colored and Mexican laborers are extremely expensive, and especially at this particular time, when the iron and steel industry is fully engaged. Hope is expressed, however, that once this class of labor becomes accustomed to work in steel mills it will develop much greater proficiency.

Help for Steel Industry

Meanwhile the iron and steel industry naturally is partial to the class of labor which it drew chiefly from Europe and surrounding areas so freely before the enactment of the 3 per cent immigration law. While at the best it will not now be able to get large numbers of employes from immigrants, there is keen interest being shown in the immigration movement beginning with the new fiscal year, with the hope that it will be possible at least to get some laborers from this source. As a matter of fact, however, the possible relief is not encouraging when the figures are analyzed.

Under the plan of straight quota immigrants, exclusive of exempted classes which do not go into industry, the number possible to be admitted under the 3 per cent law is 357,803 annually. The law permits every country to send 20 per cent of its quota in July of each year. It is believed that advantage will be taken of this provision to a greater degree next July than ever before. Granting that this is done, the immigration movement in that month would total approximately 60,000. As a matter of fact, it is believed the total will fall far below this number. It is realized also that perhaps not more than 10 per cent of these immigrants can be obtained as laborers in the iron and steel industry, so that at the best the number secured from the July movement would be less than 6000. Some officials believe that this figure might be cut by 50 per cent, making it less than 3000.

Unfilled Quotas

This calculation is based on the present status of the immigration movement and takes into account those countries which have not filled their quotas for the present fiscal year and which probably will not. It is believed, however, that some of these particular countries will send in July 10 per cent of their quotas for the next fiscal year. These countries and the number of immigrants they lack to fill their quotas for the present year are: Germany, 18,000; Sweden, 5000; Norway, 3200; Denmark, 2000, and France, 1500. England still lacks 400 of making up her quota, but undoubtedly will have done this before the new fiscal year. The countries which have fallen short of filling their quotas, it has been pointed out, do not supply a great amount of steel mill labor, although that which it does afford is of a high grade character, including as it does Germany and the Scandinavian countries. French labor, of course, is rare in steel mills.

The striking shortage of German immigration is attributed to several causes. Among them is the fact that the United States recently was an enemy country, but of more importance, it is believed, is the economic situation. It has been pointed out also that German workers actually do not have sufficient funds to pay for transportation to this country.

The allowable quotas of immigrants from these countries are as follows: Germany, 67,607; Sweden, 20,042; Norway, 12,202; Denmark, 5619; France, 5729. Ten per cent of these totals, the number which it is estimated will come from most of these countries in July, is 11,120.

Such countries as Italy, Poland, Czechosolovakia, Rumania, the Lithuanian region, and Jugoslovia, which supply steel mills with much labor, are expected to send the full 20 per cent of their quota in July. Should this come about, the number coming from Italy would be 8400 out of the 42,057, its annual quota; from Poland, 4200 out of its annual quota of 21,076; from Czechoslovakia, 2900 out of its annual quota of 14,957; from Rumania, 1500 out of its annual quota of 7419; from Jugoslovia, 1300 out of its annual quota of 6424; from Hungary, 1120 out of its annual quota of 5638, and from the Lithuanian region, 460 out of its annual quota of 6426. The total from these countries is only 19,680, but it is thought that other countries also will send the 20 per cent quota in that month, which will greatly increase their number. The United Kingdom has the highest allowable quota of all countries with a total of 77,342, and if it sent as high as 10 per cent of this total in July it would represent 7734 immigrants. Russia, which has an annual quota of 21,613, no longer is a source of any considerable immigration.

Domestic Sources

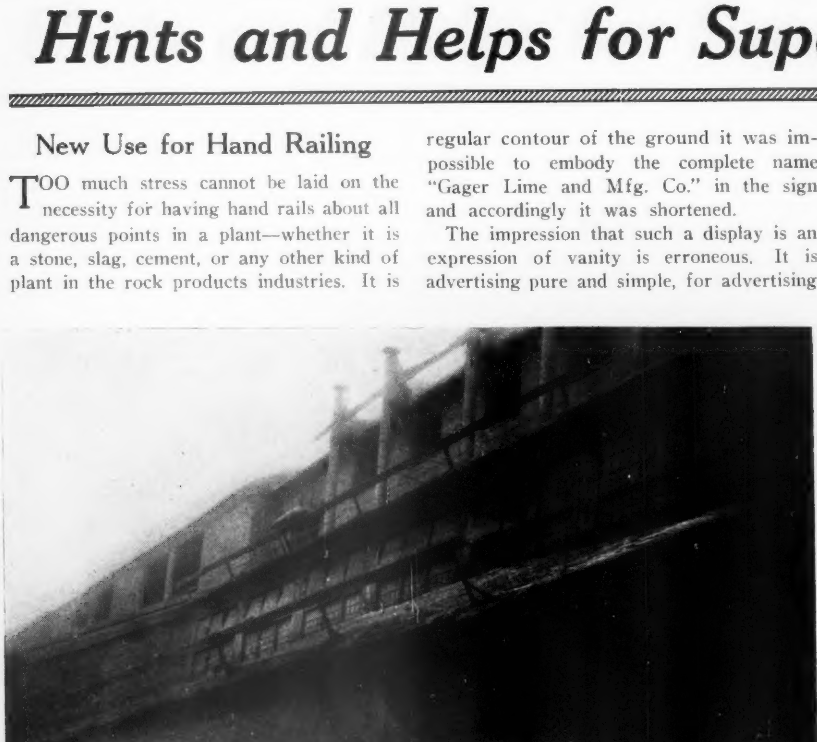
While the iron and steel industry is showing deep interest in this new immigration movement beginning with the fiscal year July 1, it is evident that it has adjusted itself to the fact that whatever changes may be made in the immigration laws, they will not be liberalized greatly. Because of this it is depending upon recruiting labor from domestic sources from which it has not drawn largely within the past and also is making earnest efforts with a great deal of success to overcome the shortage of labor by improving mechanical efficiency and by giving added incentive to increase the output production without increasing the manufacturing costs. High production figures in a number of lines, among them pig iron, sheet bars, billets and sheets, are taken to indicate the fact that the industry has had a great deal of success in this direction.

*Reprinted from *Iron Age*, May 31, 1923.

Hints and Helps for Superintendents

New Use for Hand Railing

TOO much stress cannot be laid on the necessity for having hand rails about all dangerous points in a plant—whether it is a stone, slag, cement, or any other kind of plant in the rock products industries. It is common practice to provide all stairways and openings in floors for belts and conveyors with railing, but the use to which it is put at the Southern States Portland Cement Co.'s plant at Rockmart, Ga., is unusual.



Railings at the edge of inclined roofs that have to be swept are big factors in reducing accidents

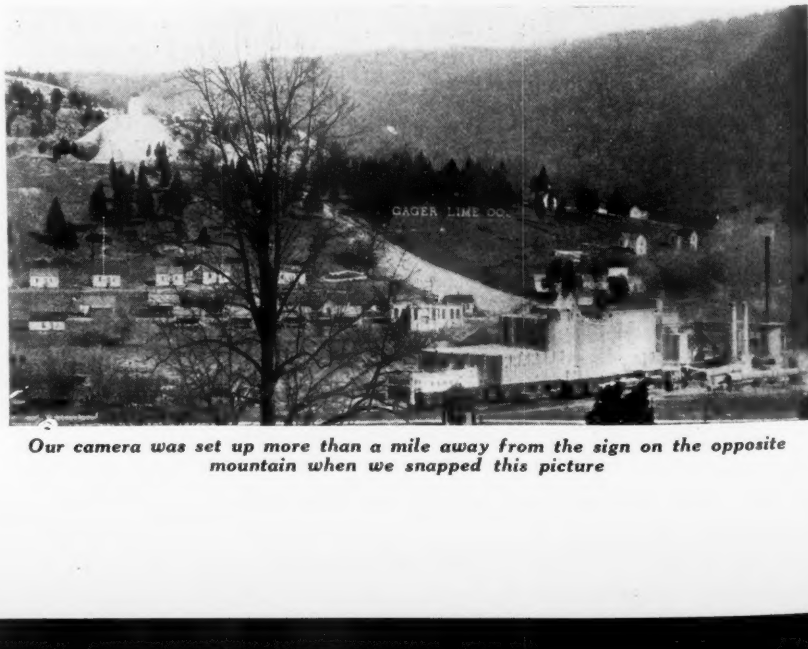
One of the illustrations shows how that company goes a step further in trying to keep down its number of accidents. On all of the sloping roofs of the buildings a substantial hand rail is mounted about 3 ft. from the edge. This is for the protection of the laborers whose duties are to sweep the roofs every week. Most of the roofs are of such a pitch that a man can easily maintain his balance and the railings serve only as a "safety" in case a man slips or loses his balance.

Advertising Your Plant

OFFICIALS of the Gager Lime and Mfg. Co., Sherwood, Tenn., believe in signs. That is, in signs that place their company's name before the public. One sign in particular on the company's premises is of novel construction and its effectiveness can be seen in the accompanying illustration.

This wooden sign is in 12 parts—each part a letter. The letters are 12 ft. high and are set up, braced, and anchored very much in the same manner as billboards are. The letters are painted white. Due to the irregular contour of the ground it was impossible to embody the complete name "Gager Lime and Mfg. Co." in the sign and accordingly it was shortened.

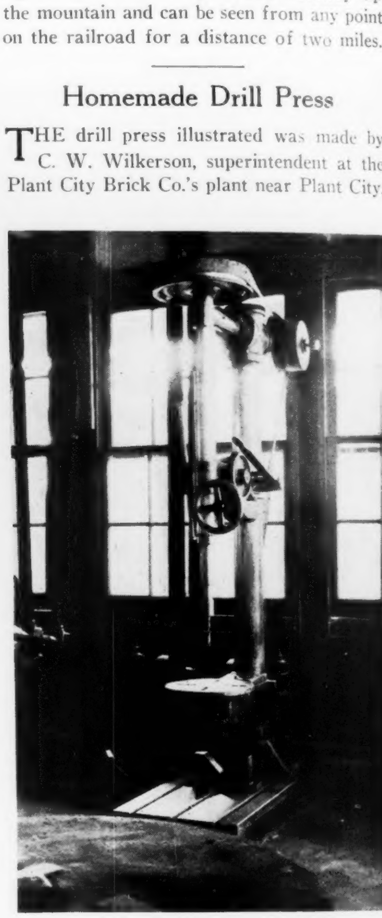
The impression that such a display is an expression of vanity is erroneous. It is advertising pure and simple, for advertising is one of the two prime factors in the marketing of any product. If the plant of the Gager company was located so that only natives in the immediate vicinity would see it, this display would rightfully be classed as a vain endeavor. But such is not the case. Although the plant is located midway of Chattanooga and Nashville and is in the mountains, it is seen every day of the year by hundreds of people. This is because it is built a few hundred feet from the N. C. & St. L. railway, the road over which the nationally-known Dixie Flyer—in two sections, both directions—passes daily. The sign is mounted conspicuously halfway up the mountain and can be seen from any point on the railroad for a distance of two miles.



Our camera was set up more than a mile away from the sign on the opposite mountain when we snapped this picture

Homemade Drill Press

THE drill press illustrated was made by C. W. Wilkerson, superintendent at the Plant City Brick Co.'s plant near Plant City,



In making this homemade drill press a quarry car, a globe valve and a Ford were robbed of parts

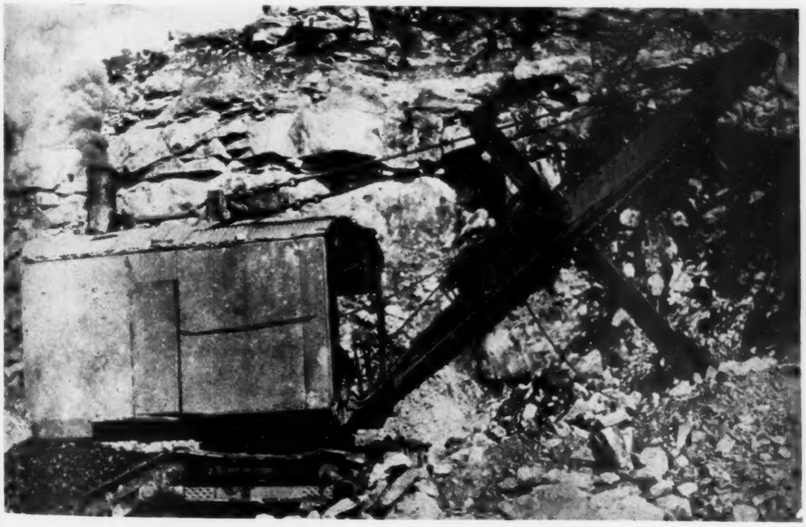
Fla., and is in service in that company's machine shop. Although it has the general appearance of a standard-type machine, it is made up almost entirely of pieces and miscellaneous parts of other equipment found around the plant.

The main standard, for instance, is a common piece of 4-in. extra-heavy pipe. At the top is fitted a common cross, bushed down to 2 in. on two sides. The rear extension from this cross supports idler pulleys which are also homemade, having been turned out of wooden blocks. The front extension from the cross is fitted with a T which holds the main shaft, or spindle, at the end of which is mounted a pulley turned out of an old carwheel. The control wheel (for running the spindle up and down) once served as a handwheel on a large valve.

The patterns for all of the necessary castings were made by Mr. Wilkerson and all of the machine work was done in the company's own shop. One small spring used in making the machine was taken from one of the workmen's cars—a Ford. The machine has been in use for the past two years and has given complete satisfaction.

Steel-Plate Covered Shovel

STEAM shovels working in rock at most stone operations are usually badly battered up. Most of them look as though they might have served as tanks in the front-line trenches. This condition is, of course, caused by secondary blasting in front of the shovel. At some quarries it is necessary to build new housings for the shovels each year.



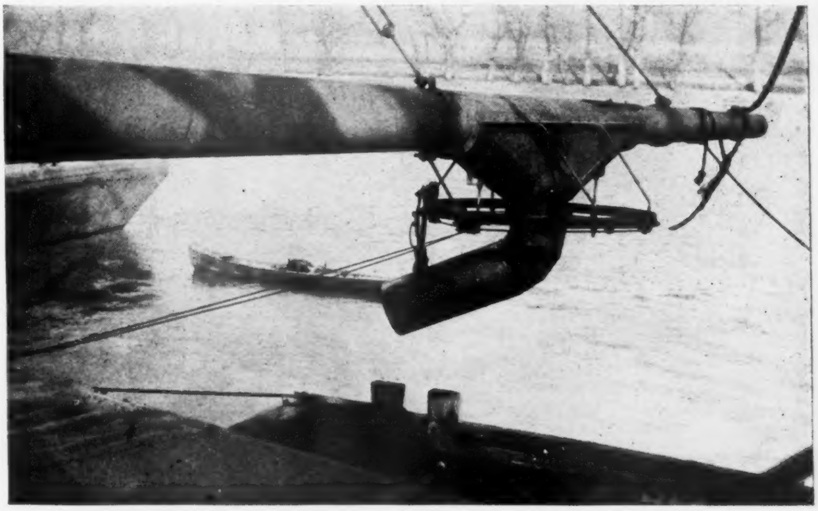
The life of a steel-plate housing is as long as that of the shovel's mechanism

At the Dixie Portland Cement Co.'s quarries at Richard City, Tenn., this difficulty is overcome by covering all the shovels with steel plate. A new shovel is used until its original cab is shot away and then, instead of putting on another wooden cab, the remaining parts of the old housing are taken off and the machine is covered on both sides and in the rear with ⅜-in. steel plate. The roof is provided with a double covering of corrugated sheet iron, and thus armored, the shovels are prepared to withstand any normal amount of abuse.

For revolving shovels, Rock Products suggests that it is necessary only to cover them on one side and in the rear. This will afford the same protection, for the machine can be swung around so that only the covered side and rear end will be exposed to the blast. This suggestion is offered so that a saving can be effected by the lessened amount of material required.

Revolving Spout

HEREWITH is illustrated a revolving spout used on the sand-loading side of the E. T. Slider Co.'s sand and gravel digger, operating on the Ohio river, five miles north of Louisville, Ky. It is easy to recognize the advantage of such a spout and to realize its simplicity of operation.



The spout is 2½ ft. long and is revolved by means of a ½-in. cable handled by a single-drum reversible engine

As the sand and gravel are screened, the gravel is chuted to conveyors and loaded on one side of the boat while the sand is flumed through a 12-in. pipe to the opposite side. This pipe extends approximately 25 ft. beyond the side of the boat and is supported by cables. At a point about 12 ft. from the boat a small hopper is riveted to the pipe, the outlet of which is round and of the same diameter as the pipe. Into this opening has been inserted a 45-deg. elbow with a grooved joint to permit turning. This elbow is fitted with a 2-ft. length of pipe.

The hopper, of course, serves as a settling tank, for as the sand and water reach it the sand deposits in the hopper and is discharged through the elbow into the barge, while the greater part of the water escapes through the pipe which is extended over the side of the barge.

These "Hints and Helps" also were obtained by an editor in the field. If he hasn't been to your plant yet, send some in yourself. Just a photo or sketch. We'll write the article.

Suspended from the hopper and supported by ¾-in. rods is a circular track, 4 ft. in diameter, in which a small pulley travels. The pulley supports the end of the pipe attached to the elbow. Thus, as the pulley moves around the track the curved spout also moves, distributing the sand evenly, rather than in a pile in the barge. The spout is revolved by means of a ½-in. cable, handled by a small single-drum reversible steam engine mounted aboard ship.

Cement Plant Employes Honor F. H. Davis on His Retirement

A GIFT-BOOK signed by 575 employes of the Santa Cruz Portland Cement Co. has been sent to F. H. Davis as manager of the plant at Davenport. Mr. Davis severed his connection with the company on May 1 after 18 years of active business life.

The book is a highly embossed volume bound in morocco, gold lettered, and containing a letter individually signed. Some of the signers have been with the plant since 1906. The letter to Mr. Davis said, among other expressions:

F. H. Davis (on the right), general manager of the Santa Cruz Portland Cement Co.; (left), Fred Davis, general superintendent

"We speak not of the great industrial plant here at Davenport, which was constructed by and through your wonderful ingenuity, nor of the magnitude to which it has grown under your skillful management and operation. . . . But it is the human side of your nature that has awakened in us a feeling of great respect and admiration. The kindness of your heart, the charity of your soul, your thoughtfulness of our welfare, the concern manifested by you for the comfort and happiness of our families, and the fair and generous treatment you have always accorded us are only a few of the splendid traits of your character which have endeared you to us and to our families.

"We pray that the future years may be kind to you. May you look back occasionally upon our long and pleasant association with the same love and esteem which so firmly binds us together today."

Mr. Davis came from New York to California and took over the management of the company in 1905, and has been an exceptionally popular busiess man with all who know him, says the Santa Cruz *News.*

Indiana Contractors Must Not Delay Road Work

CONTRACTORS building roads for the Indiana Highway Commission must complete their projects on time this year or they will be barred from bidding for 1924 contracts, according to John D. Williams, director of the commission.

"Indiana is going to have a completed system of main market highways not only connecting all parts of the state, but facilitating interstate and transcontinental traffic by the end of 1925, and the commission does not propose to be delayed by the failure of contractors to complete their work within a specified time.

"Under the three-year paving program, 153 miles will be hard-surfaced this year, 405 miles in 1924 and 400 miles in 1925. In 1922 the paving program was almost entirely completed on time."

Consumers Co. Elects Three New Directors

THREE new members were elected to the board of the Consumers Co., Chicago, Ill., on May 24. They are A. D. Lasker, president of Lord & Thomas; D. F. Kelly, vice-president and general manager of The Fair, and D. S. Boynton, vice-president of Pickands, Brown & Co.

The Consumers Co. reports the heaviest deliveries of sand and gravel, cement and crushed stone in its history, the bulk of the materials going into large construction projects now under way. The demand for all building supplies continue heavy, it is said, with prices steady at about the same levels which prevailed a month ago.

Exhibit of Slate Products

WITH the co-operation of the National Slate Association, the E. P. Henry Co., in its slate booth at the Palace of Progress exhibit, Philadelphia, showed the attractive display illustrated here.

The floor, made of green and black slate, had an eye-resting quality, blending with the variegated colors of the slate fireplace. The table, steps, risers, wainscoting and bases were also of slate. Behind the post were shelves of slate which contained the literature given out, and attractive slate checkerboards were chanced off to encourage the spectators to examine the booth closely.

Across from the slate booth was a model home—its roof of slate as well as the garden walk. In the home itself was a variegated colored roof that attracted wide attention; in the kitchen, a slate blackboard. Evidently, there is no better way to inform the public about the many uses of slate than by actual demonstration.

South Dakota's Cement Commission Requests Bids

BIDS will be received by A. C. Hunt, secretary of the South Dakota State Cement Commission at its office in Rapid City until June 13 for furnishing and erecting a structural steel framework for a 79x408-ft. raw storage building. Plans and specifications are on file at the office of the commission at Rapid City or that of the J. C. Buckbee Co., engineers, Room 1733, First National Bank building, Chicago, Ill.

MacDowell Now with the Traylor Co.

IT is announced by the Traylor Engineering and Mfg. Co., Allentown, Pa., that W. C. MacDowell, formerly manager of the mining sales department, power and mining machinery works of the Worthington Pump and Machinery Corp., joined this organization on May 1 as general sales manager.

The attractive display of the E. P. Henry Co. at its booth in the Palace of Progress exhibit, Philadelphia, Pa.

Arrowhead Portland Cement Co. to Build a $1,400,000 Plant

FILING of deeds on May 8 completed the early preparations for constructing the $1,400,000 plant of the Arrowhead Portland Cement Co., north of San Bernardino and East of Vaudemont, Calif. The plans call for the completion of the construction work early in 1924. The daily output will be 1500 bbl. and 500 men will be employed.

Virginia Commission Approves Freight Rate Reductions

NEWPORT NEWS, Va., buyers and shippers are to have advantage of a number of rate reductions recently approved by the Virginia Corporation Commission following the filing of new schedules by railroads within the state. Among the reductions are:

On crushed stone, carloads, Klotz to Kumis, via Virginian railway. On plaster, calcined and wall, carloads, Norfolk to South Boston, via Norfolk & Western. On ground limestone, carloads, from Carmine to Norfolk, Suffolk, Kirby and Petersburg, via Norfolk & Western.

Engineers of the Signal Mountain Cement Plant

THE plant of the Signal Mountain Portland Cement Co., near Chattanooga, Tenn., which has been described in these columns in previous issues, is being designed and built by the Cowham Engineering and Construction Co. of Chicago, Ill.

The Cowham organization is one of the oldest engineering firms, confining their work to the organization, building and operating of cement plants, in the country. Founded by W. F. Cowham in 1899, it has been identified with the cement industry from the days of the old vertical kiln to the present time. Many of the most prominent men in the cement industry have served their apprenticeships in its rank. They were pioneers in the building of cement plants west of the Mississippi, and the central and northern districts have many examples of their work.

At the present time the personnel of the organization is as follows: John L. Senior, president; F. E. Dodge, vice-president and chief engineer; A. C. Deer, vice-president and construction superintendent; H. J. Weeks, secretary, and F. W. Boley, treasurer.

Mr. Senior is president of the Peninsular Portland Cement Co. and the Signal Mountain Portland Cement Co. He received his early training in the cement industry in the Cowham organization and since Mr. Cowham's death has handled all of his wide connections with the industry.

Mr. Dodge who, as chief engineer, has charge of all engineering work, has been identified with the designing and building of six of the best known plants in the United States and Canada and one in South America, including one of the first waste-heat boiler installations in the industry. Mr. Deer has been in the Cowham organization for over 20 years. He has served in every possible position from stenographer to general manager. Mr. Weeks, for many years a consulting engineer on reinforced concrete, has but recently left the army, with the rank of major. During the war he held the rank of lieutenant-colonel of engineers. Mr. Boley as treasurer has many years of experience in the complicated but necessary financial reports of the cement industry.

Standard Gypsum Co. Begins Operations

THE Standard Gypsum Co., Reno, Nev., has been mining and milling the gypsum deposit of the Nevada Douglass Copper Co., at Ludwig since early in March, when the first carload of plaster was shipped from the modern new mill of the company.

The Ludwig deposit has been known for many years and supplied crude gypsum for both the Reno plant of the Western Gypsum Co. when that company was in existence and for the Mound House mill of the Pacific Portland Cement Co. in the period in which stripping operations cut down the quarry output of the latter.

In 1922, Martin Udahl, H. H. Winner and W. C. Riddell organized a company and secured a lease on the deposit. Following investigation, it was decided to install a small mill on the ground and construction of this plant began on December 2 of last year. One kettle of the two installed was put in operation early in March and the first shipment of the finished product was made on the fifth of that month, since which time continuous shipments have been made and another kettle got in operation.

Gypsum of a high grade exists in the deposit and this together with waste and overburden is handled with a ¾-yd. gasoline excavator. From the quarry the rock is carried to the crusher on an industrial railway in cars handled by a 30-hp. gasoline locomotive and to the mill on an engine plane about 350 ft. long.

A large crusher reduces the material to Raymond mill feed size and the fine crushing is effected in a five-roller Raymond mill. The calcining is done in two 10-ft. kettles and the plant has a capacity of 160 tons of plaster per day.

The Standard mill is the first in Nevada to install the Bates valve-bag sacker.

The owners declare that their product finds a ready market on the coast and that they have been, as a fact, unable to supply the demand. On a one-kettle basis, the operation has employed 30 men, divided about equally between the quarry and the mill.

The Standard company was fortunate in finding the power lines of the Truckee River Power Co. constructed practically to the millsite and many facilities on the ground which had been placed there by the Nevada Douglass to accommodate its copper mining operations.

International Cement Earns $4.06 a Share on Common in 1922

IN its calendar year of 1922, the International Cement Corp. earned, after its preferred dividends, $4.06 per share on 324,047 shares of common stock against $4.55 a share in 1921 on 323,978 common shares. The balance sheet as of December 31, 1922, shows current assets of $4,190,923; current liabilities, $623,079, and net working capital, $3,567,844.

President Struckmann says that during the year all of the plants have been kept in continuous operation with the exception of the Knickerbocker; this plant was partly shut down during the year to carry out the construction plan formulated at the time of its acquisition. The work is nearly completed and the results so far indicate that the earnings expected from the plant will be fully realized.

Toward the close of the year negotiations were entered into for the purchase of the plant and properties of the Bonner Portland Cement Co., near Kansas City, Mo. This was done on January 3 for $400,000 cash and the assumption of $200,000 outstanding bonded indebtedness. A new company was chartered as the Kansas Portland Cement Co., with $500,000 fully paid up, the $400,000 cash paid for the property and $100,000 working capital.

The new company is now operating to capacity, distributing its product to the trade as the "Sunflower" brand, and should show a satisfactory margin of profit for the year. The outlook for increased earnings over 1922 is promising, says President Struckmann.

Ohio Farmers Use More Lime

OHIO farmers have in the past two years increased almost a half their use of lime. At this rate of increase, they will be applying to the soil of the state more than 50,000 tons annually by 1935.

Soils scientists at the Ohio State University get these facts from sales reports of all Ohio companies handling agricultural limestone. The reports show that 96,000 tons of limestone were bought in Ohio during 1920; 119,000 tons during 1921; and 140,000 tons during 1922.

How Cement Is Sold in China

By M. H. Chou, M. S., University of Wisconsin
Sales Manager of the Ta Hu Cement Co., Shanghai

THE way in which the cement is sold in China differs greatly from that practiced in America and in European countries. To tell the difference, we must go back to the manner in which the construction work is accomplished. As the Chinese people are mainly divided into four classes of professions—that is, scholars, farmers, artisans, and merchants—the one does not seem to know the other's profession at all. Therefore all the construction work was carried on by the artisan.

The practice thus resorted to in such work is to contract for the whole job. The money for the whole work is to be paid in installments according to the progress of the work. As the contractors are only versed in the rudimental elements of Chinese and arithmetic, they cannot figure accurately how much one contracting job should cost. Sometimes they make too much money and sometimes they lose. If the contractors are of very good standing, they are willing to finish the job at a loss rather than to break the contract. If they are of no standing, they will run away. This unsatisfactory situation cannot be remedied until Chinese students of engineering eventually take their place.

Because the contractors are paid according to the progress of the work on one job, they have to advance money for the work for the time being. But most of the contractors do not have advance money; they must resort to the credit system, which is popular in China. It means that they can get wood from those big firms which are dealing with wood and steel and cement from those that we call "metal dealers." Because of that situation, most cement is brought by those metal dealers rather than by the consumers themselves.

In this way cement is just like other commodities such as cotton, beans, bean oil, etc., subject to wild speculation. The metal dealers will buy any brand of cement, whether Chinese made or imported, as long as the price is reasonable. Therefore this year quite a quantity of Italian cement has been bought in Shanghai because of the favorable Italian exchange and the free offer of freight.

The sales policy of the Chee Hsin Cement Co. and Hupeh Cement Co. is to sell through orders secured by their own sales office at Tsingtin and Shanghai and appointed agents in other localities. The Green Island Cement Co. directs its sales to Shewan Iomes & Co., which has offices at Hongkong, Shanghai, and Hankow. The sale is handled through the comprador, who goes around to those metal dealers for orders.

The contractors will buy cement according to its brands. They especially like those which will set in 10 hr., for the weather conditions favor such duration of time.

The way in which cement is sold in China will undoubtedly change as China becomes more industrialized. For the present, the old way of buying things still holds good.

A Small Cement Plant Near Tsingnanfu

Another small cement plant is springing up near Tsingnanfu, capital of Shangtung Province, the name of which the writer has not ascertained. The stockholders of the company are Shangtungese. It is capitalized at $200,000 Mex. The raw materials—limestone and clay—are very abundant in the vicinity of the plant. Coal is also abundant and can be supplied to the cement company at $3 to $4 Mex. a ton.

The crusher and grinding equipment are reported to have come from Germany. The vertical-kiln process is employed. First the limestone and clay are crushed to paste. After adjusting the required chemical composition, the paste is made into bricks which are placed in the kiln for burning; after burning the bricks are ground to powder.

A German manages the mill. The operation is starting right now, and the output is 250 bbl. a day. The whole output will be used in construction work at Tsingnanfu and vicinity.

"Concrete House Magazine"

"THE ideas that we envision in inaugurating the *Concrete House Magazine*," says the Portland Cement Association, in Volume 1, No. 1, of this, the latest of its many publications, "constitute permanent, economical, fire-safe, dignified and beautiful homes. And to make the vision real, this magazine is established for the service of the great home-building industry of the nation."

The leading article deals with the banker's view of the concrete house, and there are other articles equally interesting on more homes needed; attractive advertising circulars to sell houses; there's a well-planned duplex house, with plans; selling points vs. talking points, by a concrete products manufacturer; a 14-year test to prove the worth of a concrete home, and other instructive matter.

Atlas Buys Western States Co.

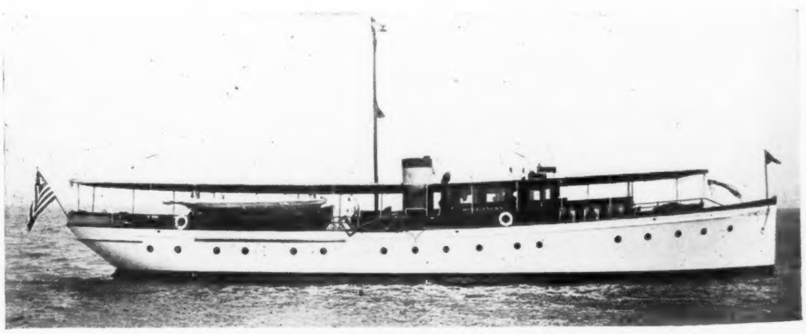
ACCORDING to President Morron of the Atlas Portland Cement Co., the Western States Portland Cement Co. of Independence, with plants in Independence, Kans., and one now under construction near Davenport, Iowa, will be sold to the Atlas Portland Cement Co. The local plant for several years had poor financial means, but under the guidance of the late A. W. Shulthis was successfully operated. Following is the statement:

The Atlas Portland Cement Co., with plants in Northampton, Pa., Hudson, N. Y., Hannibal, Mo., and Leeds, Ala., has practically concluded the purchase of the plants of the Western States Portland Cement Co., situated at Independence, Kans., and near Davenport, Iowa. The present purpose is to incorporate a Kansas company to take over the Independence plant and retain the interest and good will of many of the present directors, employes and associates as well as the public. Headquarters will remain in Independence, and the Atlas company is glad to be associated with such a thriving city.

JOHN R. MORRON, President.

Cement Manufacturers Enjoy "Cruise of the Speejacks"

AT the spring meeting of the Portland Cement Association members and guests at the banquet were treated to the first showing of about 7000 ft. of the 92,000 ft. of film taken on the recent world cruise of A. Y. Gowan's 90-ft. gasoline motor boat, the "Speejacks." Mr. Gowan was present to inject a little explanation now and then. The films are being edited for exhibition purposes in this country and abroad.



The "Speejacks," A. Y. Gowan's 90-foot motor boat

Lind Succeeds Moore as Chief Chemist and Chief Mineral Technologist of Bureau of Mines

RICHARD B. MOORE, well known for his work as chief chemist of the United States Bureau of Mines, resigned on June 1. He will enter commercial work with the Dorr Co., engineers, of New York, where he will have charge of that company's developments and act as consulting engineer in certain of its projects.

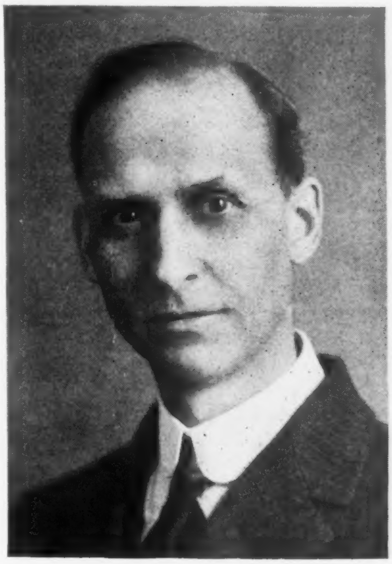
Doctor Moore's education has included work at University College, London, under Sir William Ramsay; a B. S. degree at the University of Chicago, from which he went to the University of Missouri as an instructor; in 1895 he was professor of chemistry at Butler College, remaining until 1911. The University of Colorado in 1916 made him an honorary doctor of science. Perhaps his most notable work at the bureau has been in connection with the production and purification of the rare gases, especially helium.

Dr. Samuel C. Lind has also had very thorough training in scientific work and extensive experience in the work of the bureau. His education included study at Washington and Lee University, a degree at the Massachusetts Institute of Technology; a Ph.D. from Leipzig; later he worked at the University of Paris and the Radium Institute of Vienna. When he entered the bureau as physical chemist he was acting as assistant professor of chemistry at the University of Michigan—in 1912. His chief work has been on radioactivity, radium extraction and measurements; the influence of radiation on chemical reaction; kinetics of chemical reaction, and the relations of gaseous ionization to chemical reaction. He is also the inventor of the well-known interchangeable electroscope which bears his name.

Dr. Bowles to Head Rutgers Experiment Station

DR. OLIVER BOWLES, mineral technologist of the Bureau of Mines, has been designated by the Secretary of the Interior as superintendent of the new mining experiment station of the bureau to be established at Rutgers College, New Brunswick, N. J., and which will specialize in problems involved in the production and utilization of the various non-metallic minerals. Doctor Bowles will enter upon his new duties July 1.

Doctor Bowles was born in Canada and educated at the University of Toronto, obtaining his degree of B.A. in 1907 and of M.A. in 1908. The degree of Doctor of Philosophy was conferred by George Washington University in 1922. He was engaged in field work for the Ontario Bureau of Mines during 1908-1910 and was instructor in petrography at the University of Michigan in 1908-09. Until 1914 he lectured on rocks and minerals at the University of Minnesota and made a comprehensive study of Minnesota quarries. The results of this work have been published as Bulletin No. 663 of the U. S. Geological Survey. Since 1914 Doctor Bowles has been stone-quarry and non-metallic specialist in the Bureau of



Dr. Oliver Bowles

Mines, and has written many technical papers and articles, many of which have appeared in ROCK PRODUCTS. His labors have recently been directed chiefly toward quarrying problems in the lime industry.

The new station will undertake selected problems in mining, treatment of non-ceramic uses of such non-metallic minerals as bauxite, feldspar, Fuller's earth, graphite, gypsum, limestone, mica, phosphate rock, salt, sand and gravel, slate, sulphur, garnet, asbestos, and talc.

H. D. Ruhm Elected President of New York Paint Club

AT the annual meeting of the Paint, Oil and Varnish Club of New York, held on May 10, Herman D. Ruhm, vice-president of the Ruhm Phosphate and Chemical Co., was elected president of the club for the coming year—its 36th presiding officer.

Mr. Ruhm is well known in the field of chemical engineering. He was born on June 6, 1871, at Nashville, Tenn. After receiving his preliminary education at Fogg High School, he entered Vanderbilt University of Nashville, and was graduated in 1892.

Early in his business career he devoted some time to civil engineering and engaged in construction work for the Nashville & Western Railway Co. and the North Carolina & St. Louis Railway. Later, while a member of the firm of Ruhm & Wilson, he assisted in the government survey of the Cumberland river.

The development of the phosphate rock deposits at Mt. Pleasant and Centerville, Tenn., always has been one of the subjects uppermost in the mind of Mr. Ruhm and he has been identified with this industry since 1893. In the way of achievement in the chemical industry he holds the honor of being the first man to perfect a method of producing caustic potash in this country on a profitable basis as well as on a commercial scale. From 1909 to 1916 he was vice-president and general manager of the Niagara Alkali Co., Niagara Falls, N. Y. In 1916 he became associated with the Marden, Orth & Hastings Corp. as manager of the chemical department. Mr. Ruhm also was vice-president of the Calco Chemical Co., producing coal-tar products.

In 1920 Mr. Ruhm again went into business for himself as a broker and dealer in chemicals and consulting mining and chemical engineer.

A Southerner by birth, he has shown more than passing interest in the fight to exterminate the boll weevil and is working out a plan to combine calcium arsenate with calcium phosphate so that the distribution of the poison may be accomplished in a more economical way. He is the author of several brochures on the development of a potash industry in the United States.

Mr. Ruhm is a member of the American Chemical Society, New Jersey Chemical Society, American Institute of Mining Engineers, Drug and Chemical Club, Chemists' Club, American Association for the Advancement of Science, American Electrochemical Society, Beta Theta Pi Club, Englewood Golf Club and Columbia Yacht Club.

Ford to Quarry Garnet

A PLANT for the quarrying and finishing of garnet for use in the automobile manufacturing industry will be erected almost immediately on the 200-acre property at Danbury, N. H., recently purchased by the Ford Motor Co., of Detroit, Mich. The site is declared to be one of the best in New Hampshire. Approximately $600,000 was involved in its purchase from the Garnet Grit Co., of Boston, Mass.

Nathan C. Harrison, of Boston, who acted for the Ford company in the deal, said that the company planned to quarry and ship the garnet to Detroit in its rough state until the plant was completed. The garnet powder output will be used for grinding and polishing plate glass and in the making of material used for finishing and polishing automobile bodies at the glass plant of the Ford company at Glassmere, Pa., lately purchased from the Allegheny Plate Glass Co.

Rapid Method of Analysis for Dolomite and Magnesian Limestone*

IN the analysis of dolomite and magnesian limestone for agricultural and commercial uses, a quick, easy, and fairly accurate method of finding the amount of calcium carbonate and magnesium carbonate present is very desirable. In this paper is given an indirect method which meets those requirements and seems to be generally applicable to that class of stones.

The functions concerned are: (1) neutralizing power of the stone as calcium carbonate, A; (2) insoluble residue and ammonium precipitate, B; (3) moisture, M. It does not involve the determination of either calcium or magnesium, and is fully as accurate and somewhat shorter than the usual differential method, which, in addition to the neutralizing power as calcium carbonate, requires the actual determination of calcium.

In the following table a summarization is given of the data obtained on 20 representative samples of magnesian limestones and dolomites:

TABLE I

No.	$MgCO_3$ Indirect	$MgCO_3$ Differential	$CaCO_3$ Indirect	$CaCO_3$ Differential	A	B + M[1]	
1	35.80	35.70	48.80	48.80	91.30	15.2	0.20
2	8.99	8.85	87.68	87.82	98.35	3.26	0.07
3	31.80	31.88	63.26	63.05	101.00	4.92	0.02
4	33.76	33.64	57.28	57.30	97.35	8.84	0.12
5	38.80	38.60	49.95	50.00	96.00	11.18	0.07
6	34.50	34.50	56.40	56.30	97.40	8.94	0.11
7	40.70	40.60	56.50	56.50	104.80	2.74	0.06
8	34.80	34.80	50.10	50.04	91.40	14.9	0.20
9	42.30	42.00	54.80	55.04	105.00	2.84	0.06
10	5.08	5.04	89.60	89.60	95.60	5.28	0.07
11	35.30	35.40	62.30	62.05	104.20	2.32	0.08
12	26.50	26.40	70.05	70.06	101.50	3.40	0.05
13	33.70	33.50	59.60	59.70	99.60	6.62	0.08
14	39.05	38.90	49.85	49.90	96.20	10.90	0.20
15	35.80	36.20	54.60	54.04	97.10	9.48	0.12
16	5.10	5.04	92.05	92.10	98.10	2.80	0.05
17	41.50	41.40	55.25	55.25	104.50	3.20	0.05
18	3.20	3.20	89.50	89.50	93.30	7.22	0.08
19	11.80	11.70	79.90	80.00	93.90	8.24	0.06
20	38.00	37.80	60.50	60.55	105.60	1.46	0.04

[1]Assumed except in Nos. 2, 3, and 4.

The figures for $MgCO_3$ in the column marked "Indirect" were calculated from the equation:

$$\left[A-\left(100-(B+M)\right)\right]5.35 = MgCO_3$$

which expresses the relation of magesium carbonate ($MgCO_3$) to the neutralizing power of the stone as calcium carbonate, the insoluble residue and ammonium precipitate, and moisture in dolomite and magesian limestone.

The factor 5.35 is derived as follows: Taking as known quantities a=2.274 and b =1.916, the factors for converting CO_2 into $CaCO_3$ and $MgCO_3$, respectively, and taking as unknown quantities, X representing the percentage of total CO_2 in the sample combined as $CaCO_3$ and Y representing the percentage combined as $MgCO_3$, we may write the following equations:

$$aX + bY = 100 - (B + M) \quad (1)$$
$$aX + aY = A \quad (2)$$

Solving for Y and getting BY($MgCO_3$) we have

$$bY = \left[A-\left(\frac{100-(B+M)}{a-b}\right)\right]b \quad (3)$$

Substituting for BY, $MgCO_3$, and for $\frac{b}{a-b}$ its value 5.35, we have

$$\left[A-\left(100-(B+M)5.35 = MgCO_3\right)\right] \quad (4)$$

Using Equation 4 in connection with the following equation:

$$100 \text{ Per cent} - (B + M = \text{Per cent } CaCO_3 + \text{Per cent } MgCO_3 \quad (5)$$

which is self-evident, the percentage of calcium carbonate ($CaCO_3$) and magnesium carbonate ($MgCO_3$) in the sample can be readily calculated.

A comparison in the figures in Table I for calcium carbonate ($CaCO_3$) and magnesium carbonate ($MgCO_3$) by the indirect and differential methods shows that they are of about equal accuracy. In connection with this statement it should be noted that the calcium carbonate in the column marked "Differential" was actually determined. The method here given has been checked against the differential method on more than 50 samples of magnesian limestone containing from 3.2 to 42.8 per cent $MgCO_3$ and of varying degrees of impurity. The maximum difference was 0.5 per cent $MgCO_3$. The average was slightly more than 0.1 per cent. This shows as close agreement as could be expected and indicates a reasonably wide applicability of the method.

IN his method, described in the Journal of Industrial and Engineering Chemistry, S. D. Averitt, of the Kentucky Agricultural Station, states that the functions concerned are; neutralizing power of the stone as calcium carbonate; insoluble residue and ammonium precipitate; moisture.

Details of the Procedure

One-half gram of finely ground stone is put into a wide-mouth flask of 100- to 150-cc. capacity and 25 cc. 0.5 *N* HCl added, and the sides of the flask washed down with a little water. It is then boiled gently 5 or 10 min., or until decomposition of $CaCO_3$ and $MgCO_3$ is complete. Enough hot water to maintain or slightly increase the volume is used once or twice during the boiling to wash down the sides of the flask. The solution is then cooled and the excess acid neutralized with 0.25 *N* NaOH, a small drop of methyl orange being used as the indicator, and the first change from pink to yellowish is taken as the end-point. Note exactly the volume of 0.25 *N* NaOH required to neutralize the excess acid. To the solution add 10 cc. of 10 per cent NH_4Cl solution and two drops of ammonia, heat gently until the ammonia precipitate flocculates. Filter the precipitate and insoluble residue on a washed, dried, and weighed filter; wash thoroughly with hot water, dry at 100 to 105 deg. C., and weigh. The difference is the weight of insoluble residue and ammonia precipitate.

To the percentage of insoluble residue and ammonia, precipitate a small correction for moisture, M, must be added. This correction is from 0.02 to 0.05 per cent for pure stones, up to 0.15 and even 0.20 per cent for those containing considerable amounts of insoluble residue.

A clayey insoluble residue contains more moisture than a sandy one, and its character should be noted as a guide to the worker in the assumption of moisture correction.

From the titration calculate the calcium carbonate ($CaCO_3$) equivalent of the acid neutralized by the stone, as per cent $CaCO_3$, A. The percentage of insoluble residue and ammonia precipitate, B, having been determined, and the moisture, M, assumed, we are able to use Equations 4 and 5 as has been stated.

The moisture was determined on the samples in Table I subsequent to the assumptions, except in Nos. 2, 3 and 4 as noted, and in no case was the difference more than 0.03 per cent and in a large majority only 0.01 and 0.02 per cent, from which it is evident that, with due regard to the character of the insoluble residue, the moisture may be assumed without material error.

*Presented before the Lexington Section of the American Chemical Society.

What Brains, Business Initiative Can Do With a Lime Plant

Miss Mary E. Squire, of the Allwood Lime Co., Manitowoc, Wis., an Example Whose Methods and Accomplishments Deserve Study

By Nathan C. Rockwood
Editor of Rock Products

IF I were asked "What is the most progressive lime-manufacturing organization in America?" I believe I should, upon reflection, have to answer: "The Allwood Lime Co., Manitowoc, Wis." And that statement would be made with a fairly comprehensive knowledge of many modern lime-plant operations—modern to the minute in equipment, in fuel economy and in business management.

But the Allwood Lime Co., under the management of Miss Mary E. Squire, has taken the step that all progressive lime companies are getting ready to take some time. That step is the application of accurate and specific geological and chemical knowledge to quarry and lime-plant operation, and the consequent development of special lime products of far greater profit-making possibilities than just plain ordinary lime.

Miss Squire has taken an old style lime plant, no different originally than hundreds of others about the country—many of them, by the way, abandoned—and made it a real chemical factory. And what she has accomplished any other lime plant operator could accomplish also by the same intensive study of his own quarry and his own plant and his own market possibilities.

That does not mean that every lime manufacturer could make "Vienna Lime," "Milk of Magnesia Lime," and the other special products that Miss Squire has learned to make and to find markets for. The annual consumption of these is too small at present to support many lime manufacturers. But what Miss Squire has done is merely to scratch the surface in the development of an infinite variety of special lime products for particular uses.

Of course, this brings up the issue of standardizing lime products. Undoubtedly building lime, finishing lime, chemical lime for certain purposes requiring large tonnages, should be standardized, and the inventive and progressive talent of the industry should be directed toward eliminating the uncertainties in manipulation and manufacture which cause variety in results. On the other hand, limestones have inherent qualities because of their physical and chemical structure, which the progressive lime manufacturer will always aim to capitalize to the best of his ability in the manufacture of special products.

Miss Squire's Methods

Miss Squire's methods are merely those of any natural-born student of science and a business specialist. I presume her course of procedure has been governed by a few such broad general principles as these: (1) Know your limestone thoroughly—its paleontologic character, its geological formation, its physical and chemical properties; (2) Know the physical and chemical character of the lime it will produce under a variety of possible conditions of burning; (3) Know enough about other industries to understand the market value and the market possibilities of the particular lime or limes you can produce; (4) Know how to apply all this knowledge and all these things on a commercial scale.

Miss Mary E. Squire, Secretary, Allwood Lime Co., Manitowoc, Wis.

The last is probably the most important reason for Miss Squire's success; because most any laboratory chemist can find out a lot of valuable things about lime, but it takes a business man—in this case a business woman—to put them into effect at a profit. Laboratory research work is, and can be, a huge help to every lime manufacturer, but to take maximum advantage of it he must have enough scientific and business knowledge and initiative to go on from where the research chemist leaves off and apply the knowledge gained to his own operation and his own business.

Accomplishment, Not Mere Research

This is the very point which seems to be most widely overlooked. For example, Dr. Oliver Bowles, in a recent short article on "An Untrodden Field in Lime Research," in *Chemical and Metallurgical Engineering*, said:

In attributing honor where honor is due it is a noteworthy fact that to a woman must be given credit for the only important practical work that has yet been accomplished in this line of investigation. Miss Mary E. Squire, president of the Allwood Lime Co., Manitowoc, Wis., spent four years of investigational work, and finally identified and isolated a particular limestone bed from which is manufactured a lime that commands a price as high as $200 a ton, because it fulfills the most stringent requirements of lime for processes of extreme refinement. Possibly other work of a like nature has been done, but if so it has received little publicity.

The importance of the problem has been brought to the attention of the Bureau of Mines from two other sources, one a lime producer and one a consumer. A prominent lime manufacturer is sufficiently aroused to the significance of the relation between finished lime and the physical properties of limestone that he has expressed a willingness to engage the services of a geological chemist to make a detailed microscopic study of the various formations in his quarry, together with a study of the limes produced. A specialist employed by one of the largest consumers of lime in the United States has written to the Bureau of Mines requesting information on this same subject. Such faint glimmerings betoken the approaching dawn of an active inquiry.

What are the controlling factors—the nature of the original organisms that provided the shells from which the stone was formed; the origin, whether chemically precipitated or fragmental; the degree of cementation or recrystallization; the grain size, grain shape or some other characteristic?

The problem undoubtedly has a direct

The very ordinary (except for unusual neatness) looking plant of the Allwood Li[...], near [...]

bearing on quarry processes and on lime utilization, fields in which the Bureau of Mines is enlarging its activities; but so much remains to be done that pioneer work of varying character could be profitably undertaken by several agencies. The field is open; who will supplement our present meager information?

In commenting upon the above, the editor of the journal mentioned said:

Of course, one very obvious variation is impurity, but apparently that is not the only factor nor yet the significant one. In a given limestone bed there are many strata and the different layers yield widely variant limes. Why? Is the variation a regular and progressive function of the depth? Not at all. It is true that in general the older strata will be denser, and this, of course, will have its effect. But from a geological point of view the various conditions prevailing at the time of sedimentation, such as the density of the medium, the origin of the calcareous material, the time required, etc., all affect the variety of limestone deposited. These conditions may have changed frequently in the deposition of any given bed, so that the strata vary irregularly and may change every few inches.

There is a large school that still adheres to the idea that differences in lime are due to differences in method of burning. This undoubtedly has a distinct effect, but indications have almost reached the point of conclusive proof in showing that it is not the whole story. A careful systematic study of the fundamental properties of burned limes, together with historical data as to their origin, will probably be necessary before a comprehensive answer can be given. Of course, these historical data must be specific enough to distinguish between the different limestones in the same quarry. The problem seems to offer not only a wonderful opportunity for constructive research but a fertile field for play of imagination as well. And the solution may conceivably revolutionize some phases of a tremendous industry.

A knowledge of *what causes* variations in limestone is truly a fascinating and complicated subject, but I believe Miss Squire has accomplished what she has without any very extensive knowledge in that direction. It is

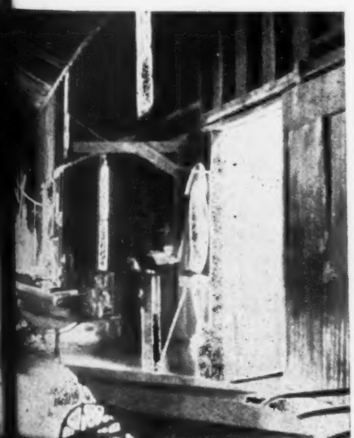
General view of the [...]lant—d[...]

General view of the quarry, where Miss Squire identifies 14 different varieties of dolomite limestone

Another view of the d[...] floor of[...]

Allwood Li[...], near Manitowoc, Wis., where lime which sells as high as $200 a ton is produced

l view of the [...]t—drawing floor



view of the d[...]oor of the lime plant

Yellow label placed in the top of every barrel or container of "Milk of Magnesia Lime" which, when wet and in contact with the lime, immediately develops a telltale indelible red stain—a very valuable asset when making damage claims

true, probably, that such variations are the result primarily of the limestone's geological history, and this phase of the study of limestones has been very much neglected; yet Miss Squire has gone ahead without all this background of research. There is nothing mysterious or erudite in the knowledge she has acquired. It is mostly applied common sense.

Utilizes Geological Knowledge

Miss Squire has used her geological knowledge of limestones chiefly to identify certain types of stone found in her quarry,

which experiment and experience have shown will yield certain results under certain conditions. By visual examination and microscopic study of stone from different levels in her quarry and from a knowledge of geology and paleontology she is able to identify 14 separate and distinct varieties of a dolomitic limestone. Any quarry man, with a little study, could learn to do the same.

But where Miss Squire has been a winner is that she has identified certain kinds of stone with certain results in the kiln under certain kiln conditions, *and she has trained her quarry and plant employes to recognize the more important characteristics of certain kinds of limestone and certain kinds of resulting lime*, as well as to maintain the conditions in the kilns necessary for successful results. In other words, she has applied her knowledge on a commercial scale.

Miss Squire's lime plant has none of the refinements found at many other plants. It is just as crude a lime plant as any, in most respects, yet it turns out the highest grade of lime manufactured in America. It is Miss Squire's achievement in management that other lime manufacturers must take off their hats to, fully as much as to her scientific knowledge.

The lime that she makes for certain purposes is a hand-picked lime from hand-picked limestone, and she has trained quarry and kiln foremen and laborers to do the picking. How she has done it is her secret, and would make interesting reading, but it is a far greater accomplishment than mere geological and chemical research.

A Resourceful Business Woman

Space does not permit a recitation of the many ways in which Miss Squire has shown her resourcefulness and keenness as a business manager. One instance will have to suffice. Shipping lime worth $60 to $200 a ton naturally means that it has some special function to perform, and if, for any reason, it fails in this function, she is pretty sure to hear about it. A little water leaking into a container, for example, may do a lot of harm.

But while sure that water leaking in was the cause of the complaint, it was naturally a hard thing to prove. So Miss Squire got busy and developed a special kind of yellow paper, which when wet, and in contact with lime, develops immediately an indelible red stain. One or more of these paper labels (see accompanying cut) goes in the top and bottom of every can. When a complaint is made the first thing Miss Squire asks for is the labels. If these have the telltale red stain she takes them to the railway claim agent, gives him a demonstration, if necessary, and claims and gets damages.

Organization Chart

The Allwood Lime Co., by the way, small as it is, has the most completely worked out organization scheme of any lime plant I have run across. It is not founded on theory or scientific management, but is the result of experience in placing responsibility where responsibility belongs. This chart hangs in a prominent place in the plant office, and it is the court of last resort when things go wrong and there is the usual tendency to "pass the buck." The whole success of her operation, one might say, depends on the fact that the "buck" can't be passed, and a quality material is the direct result.

MANAGING DEPARTMENTS

OF

ALLWOOD LIME COMPANY

MANITOWOC, WISCONSIN, A. D. 1920

M. E. SQUIRE—Secretary

Assistants—Dr. J. D. CARPENTER, MISS STEVENSON, Stenographer

418 North 8th Street, Manitowoc

DUTIES

REPORTS	Keep all Records of Company Meetings. Prepare all Reports for State, Federal Government and Corporation.
CHEMIST	Responsible for Quality of Manufactured Products and Adjustor of all Complaints concerning same and New Products.
PAYMENTS	Keep General Report Ledger of all Expenditures of every kind and attends to all business relating to Insurance—Loans—Pay Roll—Bills Payable—Salaries.
PURCHASES	Responsible for all Purchases (except Cans and Containers) Wood, Oil, Dynamite, Tools, Miscellaneous. O. K. Supply Purchases for Superintendent and Chief Engineer.
ADVISORY	Decides on Enlargements, Alterations, Replacements and Repairs at Plant. Legal Services, Law Suits, etc., except for Milk of Magnesia Lime.

J. M. LOUNSBURY—Assistant Secretary

Assistants—MISS SALAK, MISS STEVENSON, Stenographer

419 North 8th Street, Manitowoc

TRAFFIC MANGR.	Secures Empties for In and Out Traffic, Routings, Prompt Delivery, Adjusts and Collects all Damage Claims. Sends Daily Postals of Shipments to Customers.
SALES AGENT	General Sales Agent for Milk of Magnesia Lime as at Present Conducted and for Hydrate. Supervise Sale of Vienna and Building Lime to Present Customers.
SALES LEDGER	Keep Ledger Records of all Orders, Invoices, Bills Receivable, Cash Paid In and Return Cans, issue Invoices and Bills. Vienna, Milk, and Building Lime Record Book for Western Weighing Association Auditor.
COLLECTIONS	Attend to all Collections of Bills Receivable.
PURCHASER	Purchase all Cans and Containers and keep Record Books of all "Outgoing and Incoming Cans and Credits for same. O. K's Purchase Orders for General Superintendent and Chief Engineer. Signs all Checks in absence of Secretary.

M. B. STALEY—Auditor

30 North Dearborn Street, Chicago, Ill.

AUDITOR	Audits Check Book with Returned Vouchers, Sales Ledger from Superintendent's Report, Reports Ledger from Check Book.
CANS	Issues Can Credits on Reports sent from Manitowoc Office.
TRACING CARS	Traces Cars from Chicago End.

PAUL GOSZ—General Superintendent

Allwood Siding, Manitowoc, Wis., R. F. D. 7

MANUFACTURING	Manager of Manufacturing Products. Issues Quarry Reports, Stone and Wood Reports, Bills of Lading for Shipment as at Present.
BUILDING AND REPAIRS	Supervisor of all Enlargements, Alterations and Replacements of Buildings, Machinery and Equipment and Repairs.
LABOR	Hires and Fires all Quarry Labor except Assistant Engineer. Keeps Pay Roll Records of all time workers and adjusts same.
PURCHASES	Agent, for purchase of Wood from Shippers and all necessary Plant Supplies with O. K. of Secretary or Assistant Secretary.
SHIPMENTS	Responsible for Prompt Shipments and High Quality of Products.

WM. J. TILLS—Chief Engineer

Allwood Siding, Manitowoc, Wis., R. F. D. 7

	Manager of all Engines, Motors and Power Equipment. Hires and fires his own assistant.
PURCHASER	Purchases all Supplies for his Department on O. K. of Secretary or Ass't Secretary.
REPLACEMENTS	Responsible for General Upkeep of Power Equipment.

Consultation Attorneys on Reports HOUGEN, BRADY & MEYERS Manitowoc, Wis.	Attorneys for Damage Claims ALEXANDER & BURKE Milwaukee, Wis.	Patent Attorneys, Copyrights MORSELL & KEENEY Milwaukee, Wis.

TRAFFIC RATES AND ADJUSTMENTS—F. M. ELKINTON Inc., Milwaukee, Wis.

Brandt Printing & Binding Co., Manitowoc, Wis.

Organization chart of the Allwood Lime Co.—the court of last resort

A Study of Lime Kilns

IV—Heating Limestones to Dissociation Temperatures

By Arthur E. Truesdell
Consulting Engineer, Pittsfield, Mass.

THE preceding installment of this series of articles covered the subject of kilns and fuel combustion. We will now consider the process of heating limestones to the dissociation point.

Sensible or Physical Heating

Heat is taken up by the stone through radiation from the surrounding hot surfaces and by conduction from the hot gases of the products of combustion. Up to the temperature of chemical change (dissociation) this heat simply raises the temperature of the stone as sensible heat. Under the conditions existing in the kiln, the stone must be raised to a certain definite temperature before dissociation takes place freely. This physical heating of the stone involves also the heating of the brickwork of the kiln, the gases passing through and the lime passing out. Sensible heat flows readily into and through most substances which are at a lower temperature and so becomes easily dissipated. The heat losses of a kiln which are generally large are sensible heats.

Potential or Chemical Heating

Of a different nature is the heat absorbed by the limestone, after having been brought up to the temperature of dissociation by sensible heating. This heat "soaks in," producing lime and carbon dioxide without change of temperature. Being energy locked up by the chemical change, it is called potential heat. It is the heat concerned in the chemical equations and does directly the work desired. During dissociation the temperature must be maintained against the losses of sensible heat constantly going on. At and above the dissociation temperature, then, we have to supply heat to carry on the dissociation (potential heat) and maintain the temperature of the materials in the kiln (sensible heat).

While the amount of heat used in a kiln for maintaining the temperature can be lessened by good design of kiln and its careful operation, the amount of potential heat required is fixed by natural laws and cannot be changed. This heat will never reappear unless the lime is changed chemically into a substance having a lower heat content, such as, for example, into hydrate, when a part of it becomes manifest in the sensible heat thrown out in slaking. (See equation [4] in Article II—May 5, 1923, p. —.)

Dissociating the Carbonates

From a physical point of view, the separation of carbon dioxide from the carbonates of calcium and magnesium (dissociation) is similar to the evaporation of water below the boiling point. The tendency of water to evaporate (aqueous tension) varies with the temperature; so also the tendency of carbon dioxide to separate from the carbonate. The dissociation is imperceptible at low temperatures. "As the temperature rises, however, the tension of carbon dioxide coming from the carbonate increases and has a fixed value for each temperature. If it is continuously allowed to escape so that the maximum pressure is not reached, the whole of the salt ($CaCO_3$) eventually decomposes."* At atmospheric pressure the dissociation temperature is at 900 deg. Cent. If the gas discharge is restricted so as to give a pressure of 15 lb. per square inch above atmospheric pressure for the discharging CO_2 to work against, the temperature must needs be raised to 950 deg. Cent. to get free action. On the other hand, if we exhaust the gases to a pressure of 1/30th of atmospheric pressure, we can dissociate the carbonate at 700 deg. Cent. Equation (3), in Article II, already referred to, tells us that 451.5 calories are absorbed for each kilogram of calcium carbonate dissociated.

As far as the writer has been able to discover, the action of magnesium carbonate under heating is exactly similar to that of calcium carbonate, except that the tension of the CO_2 is greater at any given temperature than in the case of the calcium. That is, at like pressures, the temperature of dissociation is lower. The heat absorbed in dissociation of magnesium carbonate is calculated in similar manner to calcium carbonate, thus:

$$\underset{269900}{MgCO_3} = \underset{143400}{MgO} + \underset{97200}{CO_2} + \text{heat}$$

$$\begin{aligned} \text{Heat} &= 269900 - (143400+97200) \\ &= 29300 \text{ calories per 84 grams} \\ \text{or} &= 348.8 \text{ calories } \textit{absorbed} \text{ per kilogram of } MgCO_3 \end{aligned} \qquad (6)$$

This is something over 20 per cent less than that needed per kilogram of calcium carbonate. It is obviously then an advantage from a heating standpoint to use a stone having as high a percentage of magnesium carbonate as possible. This accounts in some measure for the popularity of dolomite as a raw material.

To those who care to study further this phase of the subject, the researches of Johnson* will be interesting. They deal particularly with the CO_2 tension at varying temperatures.

Heating the Impurities

The action of heat on the impurities has never received much attention. Tests show that although these impurities may on heating form new compounds, especially at the higher temperatures, they are generally solids and so remain in the lime. They are of small amount, as few limestones are burned that carry over 5 per cent of impurities. Some impurities, as already noted, will render the limestone unsuitable for use in making lime, even when present in slight quantities. Since none of our limestones are pure single carbonates, but a mixture of various substances, we do not know all the story of calcining lime and can only generalize from the known actions of the major substances, the carbonates of calcium and magnesium. Practically this is enough to uncover important losses in the process, the correction of which will occupy the industry for some time to come.

Heating Stone Which Disintegrates

Besides raising the temperature of the stone, heating also lessens its cohesion. This effect sometimes has an important bearing on the process. The very soft crystalline marbles on reaching a temperature of around 700 deg. Cent. become so tender that a slight jar will cause the lumps to fall apart into grains. When a charge of this stone drops in a vertical kiln, a large proportion of it will disintegrate and run like hot sand between the lumps and so choke the draft. Even if this action does not stop operations, the fine grains of the stone will become mixed with the lime, impairing its quality. Many unsuccessful attempts have been made to burn this stone in various ways. It should be burned in a kiln where it remains quiet throughout the operation as in a pot or ring kiln; or where its motion can be controlled, as in a rotary kiln.

Stone Sizing Affects Heating

Stone size is important, as will be seen from the following consideration of the

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*Smith, Alexander; General Chemistry, page 476.

*Johnson; Journal American Chemical Society 32, 938-46 (1910).

relative heat conductivity of limestone and lime. Limestone is a compact solid, weighing from 160 to 190 lb. per cubic foot. It transmits heat readily. Lime, however, is a porous solid weighing slightly over half of the weight of the limestone from which it is made. It transmits heat very poorly. The values of the heat conductivity units (C. G. S.—gram calories) at ordinary temperatures are:

Marble (white) 0017
Lime 00029*

That is, the marble conducts heat six times as readily as the lime at ordinary temperatures, and undoubtedly the same is true at high temperatures. Consequently, when a lump of limestone in a kiln has become coated with lime, it requires an increase in the temperature of the surrounding gases to drive the heat into the center of the lump and dissociate that center. If the lump is large it becomes heavily coated with lime on the outside before the center is dissociated, so that the increase of temperature must be considerable to burn the lump through in a reasonable time. This explains the difference between the temperatures of dissociation as given in the books and those practically employed; 900 deg. Cent. (1650 deg. F.) is often seen in textbooks, while observations many times show a temperature of 1250 deg. Cent. (2300 deg. F.) in kilns burning high-calcium lime.

It is also true that a given weight of material in finely divided form presents a much larger surface to the heating gases (when it can be so exposed) than in the larger sizes and consequently the heating will take place more quickly.

For these two reasons it becomes easy to understand that the smaller the limestone lumps used, the quicker will the dissociation take place and the lower the temperature necessary. These advantages in the use of the smaller sizes of stone deserve more considration than they have hitherto had. Not only will less fuel be required, as the temperatures will be less, but kiln repairs will be smaller and the output increased, which are advantages accruing to such kilns as can use the smaller sizes.

Moderate Temperatures Required

In studying the heating of limestone we must bear in mind the characteristics of the stone as already mentioned and one or two requirements for the production of good lime. The chemical action of dissociation sets free to some extent the various impurities present in the stone and allows them to effect new combinations with the lime or fellow impurities. This action is especially active at high temperatures, producing silicates, etc., which may result in a product which "pits" if used in plastering, and always in an inferior lime. Impure limestones calcine easier than the pure, but, on the other hand, are injured more readily by excessive temperatures. The temperatures in the heating chamber then must be carefully controlled, as experience and the size and character of the stone indicate.

*Richards, Joseph W.; Metallurgical Calculations, page 211.

Uniform Temperatures Desirable

The stone must be uniformly heated so that the temperature will not have to be raised to dissociate the limestone in some cold spot of the kiln, or, on the other hand, leave "core" to be encountered. Such raising of the temperature may produce inferior lime. In any case, it delays production and so the output of the kiln.

Steam, a Help

We have shown in equation (4) in article II that the heat released in slaking calcium oxide (CaO) is one-third of that necessary to dissociate it from the original carbonate ($CaCO_3$). Conversely, if we can burn our carbonate into hydrate (CaO_2H_2) instead of into oxide (CaO), we can save one-third of our fuel. Herzfeld showed that $CaCO_3$ is changed into CaO_2H_2 at 700 deg. Cent. in the presence of steam, and at 800 deg. the hydrate becomes the oxide.* Rockwood, also, has an interesting paper on the same subject.† Such a process would have great advantages, as the hydrate could be used in practically all cases where the oxide is now. The fuel used in manufacture would be much less and all machinery for making hydrate from the oxide dispensed with. Unfortunately, there seems to be no simple process to do this, as we cannot draw away the carbon dioxide from the stone without also at the same time drawing away the highly heated atmosphere of steam with it.

Under ordinary kiln conditions, efficient dissociation is materially assisted by the presence of steam in the heating gases. While there is no evidence of direct saving in the amount of potential heat necessary for dissociation (and there cannot be under the chemical laws previously noted), there is undoubtedly the practical advantages of lower heat losses, because of lower temperatures, and the better quality of lime accompanying. The steam may be introduced over the fuel bed, or by the use of damp fuel. Air dried wood normally carries 25 per cent moisture, so that no additional steam is needed when it is burned.

Quality of Product

Experience demonstrates that we can change the characteristics of the lime somewhat by changing the operating temperature of the kiln. We find that "light burned" high-calcium lime is more plastic, quicker slaking and higher yielding than when harder burned. Should it be high magnesium stone that we are buring, we might discover that the effects are different. "Light burning" in this case may mean slower slaking and more plastic than when hard burned. We know that rocks vary widely in susceptability to changes in quality by change of burning temperature and it seems probable that the dolomites are more susceptable than the high-calcium rocks in this respect. There is considerable to be discovered along these lines. If interested, the reader should study the researches of Shaw and Bole‡ in calcining dolomites under definite CO_2 gas pressures and temperatures.

*Herzfeld; Journal Society Chemical Industry 1898, page 580.

†Rockwcod, N. C.; Rock Products, September 10, 1921.

‡Shaw and Bole; Journal American Ceramic Society, November, 1922, or Rock Products, page 25, January 27, 1923.

(To be continued)

Slate Sales Increased 25 Per Cent Last Year

THE total value of all slate sold in the United States in 1922 was $9,156,484, as reported by the Department of the Interior through the Geological Survey. This amount was 25 per cent more than that reported for 1921.

The roofing slate sold amounted to 479,-243 squares, valued at $4,069,761, an increase of 38 per cent in quantity and 27 per cent in value. The quantity and value of the other kinds sold were as follows: Electrical slate, 1,329,500 sq. ft., valued at $976,022 (increases of 13 and 5 per cent); structural and sanitary slate, 2,274,200 sq. ft., valued at $810,745 (increases of 33 and 26 per cent); blackboards and bulletin boards, 3,518,700 sq. ft., valued at $880,985 (increases of 12 and 11 per cent); school slate, 2,766,610 pieces, equivalent to 1,479,-000 sq. ft., valued at $42,027 (decreases of 23 and 25 per cent); billiard table tops, 241,500 sq. ft., valued at $81,353 (decreases of 48 and 55 per cent); grave vaults and covers, 400,100 sq. ft., valued at $87,763 (decreases of 28 per cent each in quantity and value).

The quantity of slate granules sold amounted to 379,980 short tons, valued at $2,177,061 (increases of 64 and 56 per cent), and the quantity of slate sold for miscellaneous uses amounted to 5,500 short tons, valued at $30,767.

Canadian Good Roads Association Convention

THE Canadian Good Roads Association will hold its annual convention at Hamilton, Ontario, on June 1: to 14 inclusive. The slogan of the convention will be "Adequate maintenance means road economy." The estimates for road expenditures in the province of Quebec this year amount to $5,000,000. This is made up as follows: New roads, $500,000; completion of roads, $1,500,000; maintenance, $2,000,000, and $1,000,000 for resurfacing. Last year the province spent $11,000,000.

Traffic and Transportation

By EDWIN BROOKER
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning May 21:

Central Freight Association

6464. Stone, crushed, and stone screenings, Greencastle, Ind., to Sexton, Mays, and Spiceland, Ind., present, 14 cents to Sexton, and Mays and 14½ cents to Spiceland; proposed, $1.26 per net ton.

6465. Sand and gravel, Deeter and Warsaw, Ind., to Indiana:

From Deeter, Ind.

To	Per net ton. Present.	Proposed.
Thomaston	$1.15	$1.02
Brems	1.15	1.02
Knox	1.05	1.02
Ober	1.05	1.02
Burroak	1.05	1.02
Hibbard	1.05	1.02

From Warsaw, Ind.

To	Per net ton. Present.	Proposed.
Thomaston	$1.05	$1.02
Brems	1.05	1.02
Knox	1.05	1.02
Ober	1.05	1.02

6466. Silica sand, Chicago to Toronto, Ont., present, 29 cents; proposed, $3.28 per net ton.

6467. Crushed stone, St. Paul, Ind., to Indiana:

To	Per net ton. Present.	Proposed.
Waldron	$0.68	$0.63
Prescott	.69	.63
Shelbyville	.69	.63
Fairland	.70	....
London	.81	.70
Brookfield	.81	.70
Acton	.81	.70
Gallaudet	.81	.70

6478. Molding sand, Allegan, Mich., to points in C. F. A. territory. Present, sixth class; proposed, illustrations:

Albion, Mich.	$1.51
Benton Harbor, Mich.	1.51
Dowagiac, Mich.	1.51
Grand Haven, Mich.	1.51
Greenville, Mich.	1.51
Jackson, Mich.	1.51
Kalamazoo, Mich.	1.26
Muskegon, Mich.	1.51
Port Huron, Mich.	2.14
Saginaw, Mich.	1.76
Chicago, Ill.	1.76
Ft. Wayne, Ind.	2.27
Milwaukee, Wis.	2.02

*Rates apply per net ton.

6479. Sand and gravel, Terre Haute and Summit Grove to Ellery, Golden Gate, Merriam and Fairfield, Ill. Present, $1.26 per net ton; proposed, $1.15 per net ton.

6483. Sand and gravel, New Castle and Pittsburgh districts to Pennsylvania. Present, various; proposed, illustrations:

From Meyer's Siding, (West Pittsburgh), Pa., West Pittsburgh, New Castle, Pittsburgh, Junction Transfer, Allegheny (Pittsburgh, N. S.), Millvale. Proposed rates per net ton:

To	
St. Joe	$1.05
Karns	1.15
Petrolia	1.15
Parker's Landing	1.25
Foxburg	1.25
St. Petersburg	1.25
Turkey	1.40
Ritts	1.40
Jefferson	1.40
Elk City	1.40
Bryners	1.40
Clarion Junction	1.40
Point Mills	1.40
Schills	1.40
Lucinda	1.40
Snydersburg	1.60
Haskill	1.60
Crown	1.60
Vowinckel	1.60

Applies on sand (other than blast, engine, glass, rock, silica and loma), carloads; gravel, carloads.

6484. Lake and beach sand, Manistique, Mich., to Cadillac. Present, $1.26 per net ton; proposed, $1.02 per net ton.

6487. Sand and gravel, Kern, Ind., to Albion, Ill. Present, sixth class; proposed, $1.15 per net ton.

6491. Sand and gravel, Deeter, Ind., to Grovertown, Hamlet, Davis, Hanna nad Wanatah, Ind. Present, $1.10 except to Wanatah $1.12 per net ton; proposed, $1 per net ton.

6493. Sand and gravel, Deeter, Ind., to Napanee and Bremen, Ind. Present, 92 cents per net ton and 94 cents; proposed, 88 cents per net ton.

6494. Crushed stone, France Quarries, Ohio. Present, sixth class; proposed, to Miami City, Stillwater Junction, Trotwood, Air Hill, Brookville, Dodson, National Road, Wengerlawn, Verona, Gordon and Arcanum, Ohio, 90 cents; to Delisle, Jays, Greenville, D. & U. Crossing, Rush's, Nowlins Crossing and Hill Grove, Ohio, $1 per net ton.

6503. Crushed slag, Youngstown to Cleveland, Ohio. Present, 90 cents per net ton; proposed, 70 cents per net ton.

6512. Sand and gravel, Jamestown to Erie, Pa. Present, 13½ cents; proposed, $1.01 per net ton on sand, blast, engine, finishing, foundry, glass, loam, marl, molding and silica, and 90 cents per net ton on gravel and other kinds of sand.

6514. Sand, blast, engine, finishing, foundry, glass, marl, loam, molding and silica, Thornton Junction, Pa., to C. F. A. territory.

To	Present, 6th class	Proposed, per net ton
Dunkirk, N. Y.	$0.13½	$1.39
Buffalo, N. Y.	.20½	1.39
Meadville, Pa.	.12	1.13
Youngstown, Ohio	.14	1.13
Niles, Ohio	.14	1.13
Leetonia, Ohio	.16	1.26
Salem, Ohio	.16½	1.26
Akron, Ohio	.16½	1.51
Barkerton, Ohio	.16½	1.51
Chicago, Ill.	.26	2.52
St. Louis, Mo.	.31	3.28

6518. Cement, New Castle, Pa., to Falls Creek, Pa., Sutton, Pa. Present, to Falls Creek, Pa., 12 cents; to Sutton, Pa., combination of locals; proposed, 11 cents.

6522. Mixed shipments of plaster and plaster products with carload shipments of lime between C. F. A. territory and to destinations east of western termini of Eastern trunk lines. Proposed to amend Agent Kelly's Trf. 130N, I. C. C. 1210 to provide as follows:

"Plaster and plaster products, included with shipments of lime in quantities not to exceed 25 per cent of the minimum carload weights governing such shipments. Minimum weight, same as applies on lime. Rating, same rates as apply on lime, C. L.

Illinois Freight Association

1550C. Cement, C. L., commodity rates from producing points in I. R. C. territory to points on Marion & Eastern on basis of Marion combination, viz., Marion to Scranton 2 cents, Marion to Pittsburgh 3 cents, Marion to Paulton 3 cents. (365-1-74.)

1842. Sand, C. L., current minimum weights $1.01 per net ton from Forreston, Ill., to Bristol, Plano, Sandwich, Earlville, Clarion, Arlington and Zearing, Ill.; $1.14 to Wilsman, to Leonore, Ticona, La Salle, Peru and Spring Valley, Ill.; $1.01 to Hegeler, Ladd and Fulton, Ill.; 88 cents to Milledgeville, Chadwick and Laggets, Ill., and $1.01 to Savannah, Galena and Thompson, Ill.

Southern Freight Association

9965. Slag, C. L., from Copperhill, Tenn., to Baltimore, Md. Present rate, $11.25 per net ton; proposed rate, $5.61 per net ton.

9970. Sand and gravel, straight or mixed carloads, minimum weight marked capacity of car, from Norris, Ga., to Atlanta, Ga. Present rate, $1.278; proposed rate, $1.02 per net ton.

9972. Gravel and sand, straight or mixed carloads, minimum weight marked capacity of car, from Montgomery, Ala., to Jackson, Miss. Present rate, $3.20; proposed rate, $1.76 per net ton.

9980. Stone or granite, crushed, flagging, rubble or stone screening, in bulk, in straight or mixed carloads, minimum weight marked capacity of car, from Cayce and Columbia, S. C., to Phoenix, Northwest and Piedmont, N. C. Present rate, $1.13 per net ton; proposed rate, $1.35 per net ton, same as recently established from Columbia, S. C., to Wilmington, N. C.

10021. Gravel, novaculite or ganister, C. L., from Elco and Gravel Pit, Ill., to Menglewood, Stevens Junction, Finley and Richwood, Tenn. At present, combination rates apply; proposed rate, $1.21 per net ton.

10048. Lime, C. L., minimum weight, 30,000 lb., from Sherwood, Summittville, Tenn., and Cumberland, Ala., to Florence, Ala. Present rate, $2.59 per net ton; proposed rate, $2.25 per net ton.

Southwestern Freight Bureau

8424. Sand. To establish rate of 16 cents per 100 lb. on sand, carloads, from Dallas City, Ill., to Neosho, Mo. Remarks: The proposed change is claimed to be necessary to place the rate from Dallas City to Neosho on a parity with rates from other producing points to points in the Kansas Gas Belt and Joplin districts.

8469. Cement. Restore differentials under Kansas Gas Belt existing on June 24, 1918, as increased under Ex Parte 74 and reduced under I. C. C. Order 13293, subject to rules governing disposition of fractions, on cement, carloads, from Ada, Okla., to stations on the L. & R. in Arkansas and Louisiana. Remarks: It is contended that the proposed change is necessary to place the rates from Ada, Okla., to points in Arkansas and Louisiana on proper basis as compared with rates from other Oklahoma points to the same destinations.

Trunk Line Association

11348. Sand (other than blast, engine, glass, molding, foundry, ground from silica or pebble rock, silica and loam) and gravel, C. L., minimum weight 905 of marked capacity of car, from Allegheny and Junction Transfer, Pa., to points on the P. & L. E., Brownsville, Perryoplis, Connellsville, West Newton, Pa., and other points, $1.05 to $1.15 per 2000 lb.

Western Trunk Line

3158. Plaster in bags—used as dunnage to protect shipments of hollow building tile. Between points in W. T. L. territory. Present, generally classification basis; proposed, to provide for the application of the carload plaster rate on plaster in bags (other than paper bags) used as dunnage to protect shipments of hollow building tile. The weight of the plaster not to be applied toward making up the required minimum weight on hollow building tile.

A "Regular" Town

NOT only "paint-up" but "wash-up" will be a slogan in Greenville this week. And in the latter case it will be whitewash that will be used.

The city health department has announced that plenty of lime will be distributed to any asking it for the purpose of making whitewash to cover fences, outhouses or other portions of the premises.

Inspectors of the health department are making a careful and systematic round of the city and the use of whitewash is being suggested wherever things look none too good.

The lime is being furnished free of cost and anyone desiring to whiten things up a bit around their premises may obtain it simply for the asking.—*Greenville (S. C.) News.*

Quarried from Life

By Liman Sandrock

You Know Irwin G. Toepfer!

PROBABLY no other man in the sand-lime brick industry is better known—has more friends or is more enthusiastic over the future of that same brick—than Irwin G. Toepfer, of the Acme Brick Co., and the W. Toepfer & Sons Co., of Milwaukee, Wis. His friends say so—and he himself says so.

It may be the fact that he was born and raised in Milwaukee—a city once famed for its amber atmosphere and still famous for its varied industries and its sterling citizens—had a great deal to do with Toepf's fine start in life. Here he was born, on August 25, 1892; here he attended the grade and high schools, and here he acquired his engineering education and experience—in the University of Practice—by way of the machine shop and the metal work, in 1901.

Today, along with his other activities, he makes perforated metal products and conducts a machine shop where he manufactures screens, elevators, conveyors, and like equipment that goes into the rock products industry. This perforated metal business was started by his grandfather in 1855, the original plant supplying this metal to the breweries. In time the business passed on to Irwin's father and finally to him.

After brother Volstead brought about the Great Drought—well, his deadly work made it necessary to dig other channels for metal work and the Toepfer attention was turned to making equipment for our industry.

The way in which Irwin got into the sand-lime brick business is interesting. According to him, a fellow who was operating a one-horse plant in West Bend, Ind., owed Toepf some 10,000 perfectly good simoleons—when they could be grouped together. But our one-horse plant man couldn't scrape them together, even in small bunches, so in lieu of visible lucre he turned over the plant instead. At that particular moment, says Toepf, he nurtured the idea that he had received the mussy end of the stick. But did he?

In proof that he was a natural born sand-lime brick man, he sold the entire output of the plant the very first year he took it over—about a million brick. Not such a mussy end of the sand-lime stick after all, eh?

And now? Well, he operates four presses with a capacity of 100,000 brick daily. And last year, Toepf says, they sold more than 18,000,000 brick in and around Milwaukee.

As Irwin tells it, he had a peculiar experience when first introducing his brick to the Wisconsinites. The local architects were naturally prejudiced against the new brick—clay was their choice—and he got a frigid reception from them. Was he feezed? Nary a feeze was his.

He went to a man who had a house under construction. With a sand-lime brick in

Irwin G. Toepfer

one hand, Toepf started his plea for his brick. And he told us: "I held this brick. Then I swung it violently in a semicircle. It encountered a concrete post. My swing was so strong-armed that the post broke in half—*but my brick was intact!* My demonstration got me the job." Can you beat this for enterprise?

We might go on to relate many other experiences that Mr. Toepfer had while getting the trade to recognize his brick, but space forbids their relation. You must go to him for this entertainment. Mr. Toepfer tells us that he has always sold his product up to capacity ever since he started in to manufacture it.

Among his other abilities, he is a raconteur and a gourmet. He tells a good story, and what he does not know about limberger cheese, spareribs and sauerkraut, Koenigsberger klops, wiener schnitzel, and the accompanying fixin's—say!

He is also very fond of sports, one of his greatest enjoyments being motoring, for he delights to fly about the country at a 40-miles-an-hour clip; he is a close second of the mighty Nimrod as a hunter, and has a tip or two to pass on to the disciples of Izaak Walton as an angler; again, he has no mean fame as a bowler. His proudest boast however, is that he has never missed a Sand-Lime Brick Association convention.

Then there are some other ambitions that, told us in strictest intimacy, we would never dare to put in print. In the lime light of this page we are compelled to paint our portraits for the industry as a whole, and the finer tones and shadings would never reflect our real attitude and that of our sitter in the cold type—taking it for granted that he sits thus.

But, you can take it from us and from many of his friends, that Irwin is a humdinger, a whiz, and that he makes slashin's of friends—and keeps 'em! This in itself is sufficient praise for any one of us, isn't it?

They Said It

SCOTT EAMES AND ALEX MCKERNAN, of the New Haven Trap Rock Co., have been immortalized by the *Explosives Engineer's* crack artist, A. A. Blum. His sketches of quarry operations are subjects of rare beauty.

WHO SAYS engineers are consumed by their own dignity and are stiff and unbending? Listen to the Mining Engineers' latest slogan: "Toot, toot! the Institute." And coming from their president, too!

W. H. CHOU, sales manager of the Ta Hu Cement Co., of Wusieh, China, and one of our valued correspondents, tells us elsewhere that the accounts of his company "shall be cleared up at the end of the year according to the Solar calendar." O the crying out loud of a Solar calendar for Uncle Sam's domains!

SOME NEBRASKA BUILDERS are voicing the slogan, "Build with the Birds!" On the level, the twittering birds are worthy of emulation. Perched above us, we take no chances a-tall! One of 'em twittered at us to our exceeding discomfiture.

NATIONAL SAND AND GRAVEL BULLETIN: "The full-page association advertisement in this issue is reproduced from ROCK PRODUCTS of February 24. This magazine's worth is too generally known to require comment here. It is an associate member, and the courtesy of this publicity is due to Nathan C. Rockwood, editor of a journal esteemed by the entire industry." We thank you, Mr. Editor, for these very kind words, and we will try to live up to them!

WHEN 21 railroad agricultural agents tell us in ROCK PRODUCTS of May 19 that they stand behind the agricultural lime producers in educational and promotional work with all their might—well, it puts a crimp in the pessimism of the yesterdays. It's fine!

Editorial Comment

Government Aids Rock Products

An item of much more than current news interest, in the issue of May 19, modestly announced the designation of Rutgers College, New Brunswick, N. J., as the site of a new experiment station of the United States Bureau of Mines, which will specialize in the production and utilization of non-metallic minerals, or *rock products*. As the leading (we say it with all due modesty, since for over ten years we were also the *only*) exponent of the rock products industries for the past twenty years, ROCK PRODUCTS hails this event as an epoch in the history of these industries.

At last the United States government officially recognizes *rock products* as entitled to a place in its scientific research program equal to that now occupied by coal and the metal-mining industries. The problems before the new experiment station are many and intricate; and most of them are now known only to the producers themselves. The government can not be expected to hunt them out. The rock products producers must take them to the experiment station, and thus give it their moral and financial support. It is *their* laboratory; the government is merely providing the staff and the equipment. Whether these are used adequately to meet the needs of the industry depends upon the industry itself.

The selection of Dr. Oliver Bowles as director of the new experiment station is particularly happy, because he is the one man on the staff of the Bureau of Mines thoroughly familiar with quarry operations, and with the growing economic importance of the quarry industries.

Car and Coal Supplies

There is more coal moving now than ever before at this time of year and consequently there is a general shortage of open-top cars. The railways are advocating stocking up on coal, and many of them are taking their own advice. As there is little prospect of any great reduction in coal prices, many large consumers are accumulating big stock piles. While this is working some present hardship on aggregate producers, undoubtedly it will be a good thing for them as the season advances. Car loadings of all commodities continue to exceed all records, as well as the estimates of the American Railway Association. For the week ending May 5 the total carloads of revenue freight handled were 961,029. This is 40,000 cars more than the estimate for this week, published in the chart of car loadings in the April 21 issue of ROCK PRODUCTS.

In spite of this coal traffic, the American Railway Association's statistics show that sand, gravel, stone and slag are also moving in greater volume than ever before in the history of the industries. Car loadings of these commodities are in the neighborhood of 50,000 cars a week, which is from one-third to one-quarter of the present coal movement. Incidentally, this illustrates one reason why the railways must have some regard for the mineral aggregate traffic, the coal traffic notwithstanding.

There is every reason to believe that the coal traffic this year will be strung out through the summer much more uniformly than ever before. How much of a benefit this is going to be to the aggregate industries, which usually have a surplus of cars to draw upon, remains to be seen. All kinds of propaganda are being used to maintain the coal traffic—coal operators urging no price reductions, and railway and government officials holding out the probability of transportation shortage in the fall months, as usual.

It is difficult to follow the arguments of people who prophesy another transportation shortage in the fall months, in the face of the now almost universal tendency of big coal users to stock coal during the summer months, and the almost certain falling off in the present construction boom in the face of an acute labor shortage and extravagant wage demands on the part of building trades labor.

We can't help thinking that the whole thing is really nothing but a part of the carefully planned propaganda to keep up the demand for coal and facilitate its distribution by spreading it over the summer season. The argument now being used by the coal interests is that wage agreements in the coal industry will prevent any reductions in the price of coal, but that the slackening demand will send many coal operations to the wall, so that when fall comes around there will be none too many mines in operating condition to supply the usual fall and winter demands, and prices will go up. As to the merits of this argument we are not prepared to say, but the big coal-using industries generally are taking advantage of the present position of the coal operators to stock up to a greater degree than ever before. Many coal mines are obviously operating with very little profit today, and their owners and customers naturally want to postpone the day of reckoning as long as possible.

Promotion and Sales

Some members of trade associations fail to get the distinction between *promotion* and *sales*. Promotion is advertising—publicity—whether the medium employed is the printed page or the personal representative. Promotion is selling an idea and, in the case of a trade association activity, can never be successfully combined directly with the sale of the promoted product. Failure to comprehend this distinction has ended in disaster.

New Machinery and Equipment

For Crushing Gravel at Sand Plants

MANY sand and gravel plants waste pebbles and boulders larger than 2 in. because these operations were not designed to take care of this material, either because their encounter was not foreseen, or because it was believed that there would be gravel enough without them. Nevertheless, these pebbles and boulders have to be dug, conveyed, elevated, washed and screened—only to be wasted. Illustrated herewith is a crushing and screening unit which can be easily installed at any sand plant—and a waste product converted into cash.

The Iowa Manufacturing Co., Cedar Rapids, Iowa, has placed on the market a one-piece portable screening and crushing outfit suitable for either gravel or stone. It consists of a No. 936 Cedar Rapids jaw crusher mounted on the rear end of a 10 in., 15 ft. steel I-beam truck with 36x10 in. steel base roller-bearing rear wheels and 30x8 in. steel disc roller-bearing front wheels. The body and parts are of cast steel. The truck has a full universal and tractor tongue, thus making due allowance for easy haulage.

Ahead of and above the crusher is mounted a screen, with a 5-in. I-beam frame, 36 in. x 8 ft. inside screen and 48 in. x 7 ft. outside screen. The inside screen has 1-in. perforations, and the outside, 2 in. The size of perforation is made to specifications, as desired.

On the outside of the truck frame and fastened to it is a 6-in. channel iron frame elevator, equipped with 14x7 in., 14-gage steel, continuous-type buckets, mounted on a combination chain, with heavy chilled iron traction wheels on top and bottom.

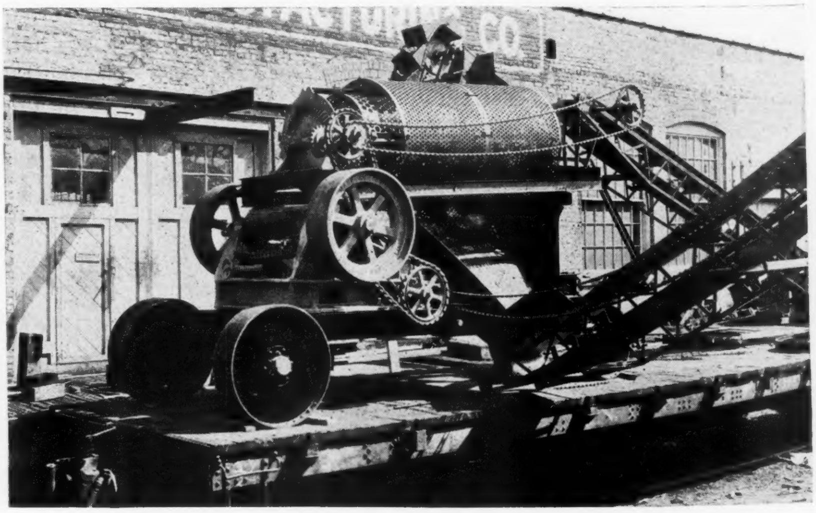
One 30-ft. and one 35-ft. belt conveyor are equipped with the machine. One feeds the screen while the other takes the discharge from the screen. The conveyors are equipped with 12x18-in. steel spit head pulleys and 10x18-in. steel split tail pulleys. Each conveyor has two 40x5-in. steel wheels for portability.

The 30-ft. conveyor feeds the material from the pit into the screen where the separation is made. The screenings go down the large chute into the 35-ft. conveyor, which carries the material to the finished bin. Rejections drop into the crusher, are reduced to proper size, discharge down the chute into the bucket elevator and are returned to the screen.

The portable outfit, showing complete working arrangement

The power for the various units is taken off the crusher shaft by sprocket and chain drive to a countershaft in the truck frame, thence by sprocket and chain to the various units. This makes a compact arrangement, as the power applied to the crusher flywheel is the only drive necessary.

The weight of the outfit complete is approximately 20,000 lb., 16,000 lb. of which is mounted on the four-wheeled truck, the rest being absorbed in the two belt conveyors; these conveyors are portable as separate units.



The portable outfit, showing crusher, screen, top of elevator and belt conveyors; also the drive arrangement

Easier Reading Mercury Thermometers

WHILE no fault could be found with a well-made mercury thermometer on the grounds of accuracy, this type has met with much criticism because it was difficult to read, says the C. J. Tagliabue Mfg. Co., Brooklyn, N. Y. Mercury was necessary from the standpoint of accuracy, but nothing could be done to increase the visibility of the mercury.

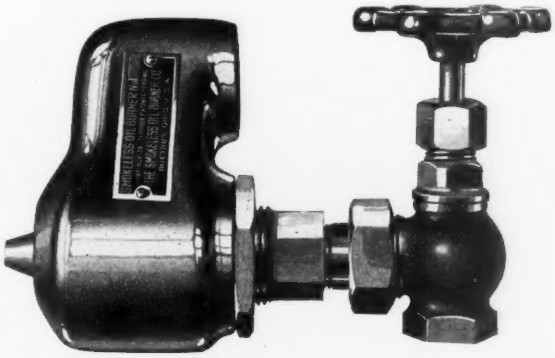
A new method of tube construction, however, has overcome this shortcoming of the mercury thermometer, it is claimed by this company. The feature, known as the TAG-Hespe red reading column, shows a broad red line from the top of the mercury column to the top of the tube. When the mercury rises it covers more of this red line; when the mercury falls, a correspondingly greater length of the red line is visible. This red line attracts the eye at first glance and it is easy to follow it down and take the reading. This feature brings to the accurate mercury thermometer the easy readability of the red spirit thermometer.

The company has secured the sole manufacturing and selling rights of this improvement as applied to all types and forms of mercury thermometers for industrial purposes.

A Smokeless Oil Burner

AN oil burner, the features of which are stated to be ease of control, range of capacity, simplicity of construction, non-drip, non-clog and smokelessness, is manufactured by the Smokeless Oil Burner Co., Bucyrus, Ohio.

This smokeless feature, says the company, makes it particularly valuable to the lime, gypsum, and kindred industries where the product must be guarded against impurities. It is adaptable to cement and lime kilns, rotary driers and boilers, both in power plants and on equipment such as steam locomotives, locomotive cranes and steam shovels.



This smokeless oil burner can be used on cement and lime kilns, driers and all kinds of boilers

Both high- and low-pressure burners are manufactured. The high-pressure burner operates on either compressed air or steam from 25 to 250 lb. pressure; if steam is used for atomizing, as is best in lime burning, the higher the pressure, the dryer the steam, and therefore the more satisfactory.

The low-pressure burner is said to operate on compressed air or steam at any pressure up to 125 lb., and on low-pressure air from 1½ lb. up. This burner is claimed to be ideal for boilers of 250 hp. or over.

The oil may be supplied by pump pressure or by gravity. Where heavy oil is used it should be heated to the point where it will flow freely from the nozzle tip.

The burners may be adjusted to throw a long narrow flame or a broad short flame, as may be required. They are said to burn all grades of fuel oil and are easily adjusted from the rear, thus eliminating the inconvenience of handling a hot nose cap.

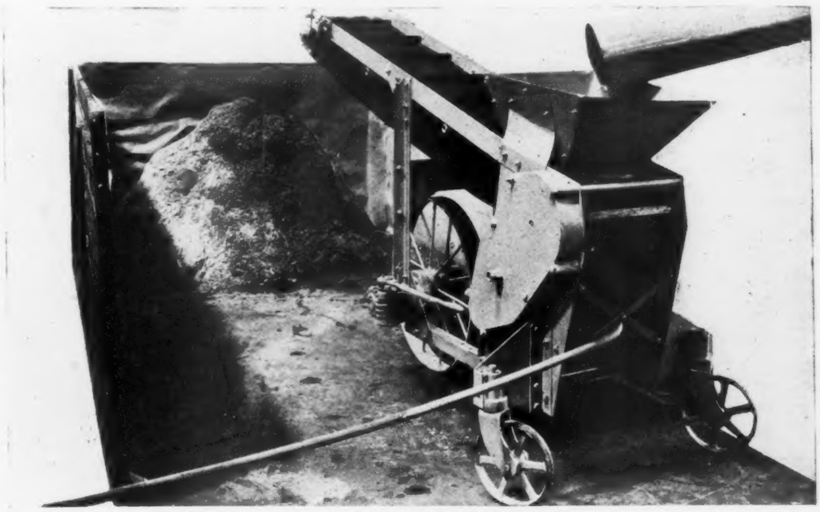
This company also handles oil storage tanks, pumps—both steam and electric—oil strainers, air compressors, blowers and pyrometers.

Light-Weight One-Man Box Car Loader

ANNOUNCEMENT has recently been made by the Ottumwa Box Car Loader Co., Ottumwa, Iowa, of the placing on the market of a new type conveyor loader, designed for the loading of lime, crushed stone, sand and gravel, phosphate and other similar bulk materials.

The manufacturer says that the machine, which is portable, can be pushed from place to place by one man. This, they claim, is because the main weight of the machine is carried on the large wheel in front, which is of such large diameter that grinding and turning is made easy. Also, this makes it possible to push the machine over small obstructions on the floor without any great effort.

All bearings are either ball or roller, no plain bearings being used in the machine whatever. The Alemite lubricating system is used throughout the machine, so that the usual disadvantage caused by spilling oil, thereby collecting dirt, has been eliminated.



The main weight is carried on the large wheel in front so that the machine can be easily pushed by one man

All gearing and other moving parts are housed to protect them from being cut or becoming clogged by dirt and other abrasive materials.

The outstanding feature of the loader, it is said, is that the conveyor can be quickly adjusted—raised or lowered as desired. This makes it possible to push the machine through a low door with the conveyor end lowered, and, with practically no loss of time, raise it to the desired height.

The loader is furnished with either an electric motor or gasoline engine, as required. The company states that the power requirement is low and that the cost of maintenance is reduced to a minimum because of the few working parts.

Manifold Safety Lubricator

A RECENT development in the lubrication of machinery is the Keystone manifold safety lubricator, a device said by the manufacturers, the Keystone Lubricating Co., Philadelphia, to make it possible to lubricate many machine bearings under various adverse conditions from a centrally located reservoir of 1, 4, or 8 lb. capacity. The different capacities are fitted respectively with 11, 15, and 21 discharge outlets, each controlled by its individual valve and connected by flexible tubing with a single bearing. A complete turn of the compression wheel forces ¼ lb. of grease through the feed lines, so that the operator can measure off accurately a definite amount of grease, and deliver it into a distant bearing.

The significance of this new method of lubrication, claims the company, will be apparent to anyone who is at all familiar with lubricating practice. First of all, the operator's time is saved, an item of importance where there is considerable machinery to be cared for. The lubricant itself is also used more economically. Probably the largest single item of economy to be considered, it is claimed, is the elimination of neglect, resulting in damaged machinery and shutdowns, because the operator will no longer have to expose himself to intense heat, electric current, moving machinery, high places, close clearances, or other conditions that tempt him to neglect his duty. Obviously, the number of injuries to employes should also be greatly diminished.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	......
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00	......	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	......
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Pennsylvania	1.25	1.35	1.40	1.35	1.25	1.25
Munns, N. Y.	1.00	1.40	1.40	1.30	1.30	1.30
Prospect, N. Y.	.80	1.40	1.40	1.30	1.30	......
Walford, Pa.	1.55	1.55	1.55	1.55	1.55	1.55
Watertown, N. Y.	1.00	......	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.50	......	1.50	1.35	......	......
Buffalo, Iowa	.70	......	1.35	1.15	1.20	1.20
Bloomville, Middlepoint, Dunkirk, Bellevue, Ohio	1.00	1.10	1.10	1.00	1.00	1.00
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	......
Chicago, Ill.	.80	1.50	1.10	1.10	1.10	1.10
Dundas, Ont.	.95	1.35	1.35	1.35	1.10	1.10
Greencastle, Ind.	1.25	1.10	1.00	.90@1.00	.90@1.00	.90@1.00
Krause, Columbia and Valmeyer, Ill.	1.20	1.20	1.30	1.30	1.30	1.30
Lannon, Wis.	.80	1.10	1.10	1.00	1.00	1.00
Mitchell, Ind.	1.00	1.00	1.00	1.00	1.00	1.00
Montreal, Canada	.90	1.20	1.10	1.00	.95	.95
Montrose, Iowa	......	1.50	1.60	1.55	1.45	1.40
Sheboygan, Wis.	1.10	1.10	1.10	1.10	......	......
Southern Illinois	1.35	1.25	1.25	1.25	1.20	......
Stolle, Ill. (I. C. R. R.)	1.30	......	1.35	1.35	1.35	1.35
Stone City, Iowa	.75	......	1.50	1.40	1.35	......
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
			Prices include 90c freight			
Waukesha, Wis.	1.00	1.00	1.00	1.00	1.00	1.00
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	......
Bridgeport, Texas	1.40	1.40	1.40	1.40	1.25	1.25
Bromide, Okla.	.75	2.00	1.75	1.60	1.50	1.25
Cartersville, Ga.	1.25	1.75	1.75	1.15	1.15	1.15
Chickamauga, Tenn.	1.00@1.25	1.00@1.25	1.10@1.25	1.10@1.25	1.10@1.25	......
El Paso, Texas	1.00	1.00	1.00	1.00	......	......
Ft. Springs, W. Va.	.90	1.45	1.45	1.40	1.35	1.30
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	......
Ladds, Ga.	......	......	1.40	1.40	1.40	......
Morris Spur (near Dallas), Tex.	1.25	1.25	1.40	1.40	1.40	1.25
WESTERN:						
Atchison, Kans.	.50	1.90	1.90	1.80	1.80	1.80
Blue Spr'gs and Wymore, Neb.	.20	1.65	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.35	......	1.10	1.35	1.10	......
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.50	1.35	1.15	1.00	......
Bound Brook, N. J.	1.70	2.10	1.80	1.50	1.40	......
Dresser Jct., Wis.	1.00	2.25	......	1.75	2.00	......
Duluth, Minn.	1.00	2.25	1.90	1.50	1.50	......
E. Summit, N. J.	1.80	2.30	1.90	1.60	1.40	......
Eastern Massachusetts	.85	1.75	1.75	1.40	1.40	1.40
Eastern New York	.75	1.50	1.50	1.30	1.40	1.30
Eastern Pennsylvania	1.25	1.55	1.50	1.40	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.50@2.00	1.35@1.50	1.15@1.25	1.00@1.10	......
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	......
Richmond, Calif.	.50*	......	1.50*	1.50*	1.50*	......
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	2.00	2.20	2.20	1.80	1.75	1.60
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	......

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Atlanta, Ga.—Granite	1.47	2.07	2.07	1.97	1.97	......
Buffalo, N. Y.—Granite	.90	......	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	......
Columbia, S. C.—Granite	.50	......	2.00@2.50	2.00	......	1.75@2.00
Dundas, Ont.—Limestone	1.00	1.35	1.35	1.25	1.10	1.10
Eastern Penna.—Sandstone	.85	1.60	1.55	1.35	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.75	1.75	1.50	1.35	1.25	1.25
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	......	1.20	......
Middlebrook, Mo.—Granite	3.00@3.50	......	2.00@2.25	2.00@2.25	......	1.25@1.50
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	......	1.50	......

*Cubic yard. †Agrl. lime. ||R.R. ballast. §Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

(Pulverized)

Chaumont, N. Y.—Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$—Thru 100 mesh; sacks, 4.00; bulk	2.50
Grove City, Pa.—Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$; 60% thru 100 mesh; 45% thru 200 mesh; 100% thru 20 mesh; sacks, 5.00	3.50
Hillsville, Pa.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, 5.00; bulk	3.50
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk	2.50
New Castle, Pa.—96% $CaCO_3$, 1.40% $MgCO_3$—75% thru 100 mesh, 94% thru 50 mesh; sacks, 5.00; bulk	3.50
Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk	3.00
Watertown, N. Y.—Analysis, 96% $CaCO_3$; .02% $MgCO_3$; 90% thru 100 mesh; bulk, 3.00; sacks	4.50
West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk	3.00
Alton, Ill.—Analysis, 97% $CaCO_3$, 50% thru 4 mesh	4.00
0.1% $MgCO_3$; 90% thru 100 mesh	6.00
Belleville, Ont.—Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Chasco, Ill.—Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh	5.00
90% thru 50 mesh	1.35
Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh	1.80@3.80
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80-lb. paper sacks	5.00
Bulk	3.50
Piqua, Ohio—100% thru 100 mesh; bulk, 5.50; bags	7.00
50% thru 100 mesh; bulk, 2.10; bags	2.25
80% thru 100 mesh; bulk, 3.50; bags	5.00
Yellow Springs, Ohio—Analysis, 96.08% $CaCO_3$, 63% $MgCO_3$; 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk	4.25
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 50% thru 100 mesh	1.50
Hot Springs, N. C.—50% thru 100 mesh; sacks, 4.25; bulk	2.70
Knoxville, Tenn.—75% thru 100 mesh; bulk, 2.70; bags, 3.95; 80% thru 200 mesh; bulk, 3.50; bags	4.75
Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; bulk	2.75
Mountville, Va.—Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks	5.00
Colton Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk	4.00
Lemon Cove, Calif.—Analysis, 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk	4.50

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.1% $MgCO_3$; 90% thru 50 mesh	1.50
Bellevue, Ohio—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh	1.25
Bettendorf, Iowa, and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.25
Buffalo, Iowa—90% thru 4 mesh	1.00
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 100% thru 10 mesh, 90% thru 50 mesh	1.50
90% thru 4 mesh, cu. yd.	1.35
Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$; 90% thru 4 mesh	.80
Columbia, Ill., near East St. Louis—⅛-in. down	1.25@1.80
Elmhurst, Ill.—Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$; 50% thru 50 mesh	1.25
Huntington and Bluffton, Ind.—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh	1.25

(Continued on next page)

Agricultural Limestone

(Continued from preceding page)

Greencastle, Indiana.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	2.00
Kansas City, Mo.—50% thru 100 mesh	1.50
Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh	1.20
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 32% thru 50 mesh; 51% thru 50 mesh; 100% thru 4 mesh; 83% thru 10 mesh; bulk	1.25
Milltown, Indiana.—Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$; 33.6% thru 100 mesh, 40% thru 50 mesh	1.25@ 1.65
Mitchell, Ind.—Analysis, 97% $CaCO_3$, 1% $MgCO_3$; 50% thru 100 mesh, 90% thru 4 mesh	1.25
Montrose, Iowa.—90% thru 100 mesh	1.25
Narlo, Ohio.—Analysis, 56% $CaCO_3$ 43% $MgCO_3$; limestone screenings, 37% thru 100 mesh, 55% thru 50 mesh, 100% thru 4 mesh	1.50@ 2.00
Ohio (different points), 20% thru 100 mesh, bulk	1.25@ 1.50
Piqua, Ohio—100% thru 4 mesh	1.25
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ⅛-in. mesh	1.30
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Toledo, Ohio.—¼ in. to dust, 30% thru 100 mesh	1.50
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75
Alderson, W. Va. — Analysis, 90⅛ $CaCO_3$; 90% thru 50 mesh	1.75
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh	1.50
Cartersville, Georgia.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—all passing 10 mesh	1.75
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh	3.00
50% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 100 mesh	1.50
Ladds, Ga.—50% thru 50 mesh	2.00
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCO_3$; 50% thru 50 mesh	.50
Kansas City, Mo., Corrigan Siding—50% thru 100 mesh; bulk	1.80
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

Glass Sand:	
Berkeley Springs, W. Va	2.25@ 2.50
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.—Damp	2.50
Columbus, Ohio	1.50@ 2.00
Dunbar, Pa.—Damp	2.50
Falls Creek, Pa	2.25
Hancock, Md.—Damp, 1.50; dry	2.00
Klondike and Pacific, Mo	2.00@ 2.50
Mapleton, Pa.	2.25@ 2.50
Mapleton Depot, Pa.—Dry	2.75
Massillon, Ohio	3.00
Michigan City, Ind	.50
Millville, N. J. (green)	2.00
Mineral Ridge, Ohio	3.00
Montoursville, Pa.	2.00
Oregon, Ill.	2.50
Ottawa, Ill.	1.50@ 1.75
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Rockwood, Mich.	2.50@ 2.75
Round Top, Md	2.25
Sands, Pa.	2.50
San Francisco, Calif	3.00@ 3.50
St. Louis, Mo.	2.50@ 3.00
St. Mary's, Pa	2.50
Thayers, Pa.	2.25
Utica, Ill.	1.50
Zanesville, Ohio	2.00@ 2.50
Foundry Sand:	
Albany, N. Y.—Molding fine, coarse and brass molding	2.25
Sand blast (kiln dried)	4.00
Core	1.50
Allentown, Pa.—Core and molding fine	1.75@ 2.00
Arenzville, Ill.—Molding fine	1.50@ 1.75
Brass molding	1.75@ 2.00
Beach City, Ohio.—Core, washed and screened	2.00@ 2.50
Furnace lining	2.50@ 3.00
Molding fine and coarse	2.25@ 2.50
Cheshire, Mass.—Furnace lining, molding fine and coarse	5.00
Sand blast	5.00@ 8.00
Stone sawing	6.00
Cleveland, Ohio.—Molding coarse	1.50@ 2.00
Brass molding	1.50@ 2.00
Molding fine	1.50@ 2.25
Core	1.25@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, f.o.b., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica, N. Y	.75	.75	.75	.75	.75	.75
Ambridge and So. Heights, Pa.	1.25	1.25	1.25	.85	.85	.85
Buffalo, N. Y	1.10	.95			.85	
Erie, Pa.	.75		.90		1.10	
Farmingdale, N. J	.48	.48	.75		1.10	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me	.50	.50	1.50		1.35	1.25
Machias, N. Y	.75	.75	.85	.85	.85	.85
Pittsburgh, Pa.	1.25	1.25	1.25	.85	.85	.85
Portland, Me.		.50	1.75		1.35	1.35
Washington, D. C. (Rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.40				.90
Barton, Wis.		.40@ .60		.50@ .70	.50@ .70	
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75@1.00	.75@1.00	.65@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Iowa	.50	.50	1.60	1.60	1.60	1.60
			Unwashed ballast, .50 ton 60-40 sieves, .85; pebbles, .95			
Dresden, Ohio	.70	.60	.60		.90	
Earlestead (Flint), Mich	.70					
Eau Claire, Wis.	.40	.40@ .45	1.00@1.25			.85@ .90
Elkhart Lake, Wis.	.66	.60	.76	.76	.70	.70
Ft. Dodge, Iowa		1.22		2.17		
Grand Rapids, Mich		.50		.80	.70	
Hamilton, Ohio					.90	
Hawarden, Iowa	.60	.50			1.60	
Hersey, Mich.	.50	.50			.75	.75
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.65	.65	1.75		.175	1.65
Mankato, Minn. (pit run)	.50	.50	.60			1.35
Milwaukee, Wis.	1.11	1.11	1.36	1.36	1.36	1.36
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	1.00	1.00	1.30	1.30	1.30	1.30
Riton, Wis.		.40			.60	
St. Louis, Mo., f.o.b. cars	1.20	1.45		1.45		1.45
St. Louis, Mo., deliv. on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	.75	.75	.75	.90	.90	.90
Waukesha, Wis.	.50	.50	.80	.80	.80	.80
Winona, Minn.	.40	.40	1.25	1.10	1.10	
			(.05 ton discount 10 days)			
SOUTHERN:						
Atlanta, Ga.	.75	.75		.90	.90	.90
Birmingham, Ala.	1.48		all gravel 1.88			
Charleston, W. Va.	all sand 1.40		all gravel 1.50			
Estill Springs, Tenn	1.35	1.35		1.00	.85	.65
Ft. Worth, Texas	1.75	1.75	1.75	1.75	1.75	1.75
Jackson's Lake, Ala	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	1.00	1.00	1.00	1.00	1.00	1.00
Lake Weir, Fla.		.60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.00	1.00	1.80	1.80	1.80	1.80
N. Martinsville, W. Va	1.00	1.00		1.20	1.00	.80
New Orleans, La	.25			.85		
Roseland, La.	.50		.85	.85		
WESTERN:						
Grand Rapids, Wyo	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw river sand, car lots, .75 per ton; Missouri river, .85)					
Los Angeles, Calif		.70	1.20	1.20	1.10	1.10
Pueblo, Colo.	1.10*	.90*		1.50*		
San Diego, Calif.†	.50@ .70	.80@1.00	1.30@1.80	1.35@1.65	1.10@1.40	1.10@1.40
San Francisco, Calif		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.25*	1.25*	1.50*	1.25*	1.25*	1.25*
Spring Valley, Calif	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine sand, 1/10 in.	Sand, ¼ in.	Gravel, ½ in.	Gravel, 1 in.	Gravel, 1½ in.	Gravel, 2 in.
Atlanta, Ga.	.30@ .40	.30@ .40				
Boonville, N. Y	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo			River sand, .80 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dresden, Ohio		.60				
Dudley, Ky. (crushed sand)	1.00	1.00		.90		
East Hartford, Conn			.65 per cu. yd.			
Elkhart Lake, Wis	.70	.50			.60	.60
Estill Springs, Tenn						.85
Fishers, N. Y		.50@ .65		.50@ .65		
Grand Rapids, Mich						.50
Hamilton, Ohio					.60	
Hartford, Conn.		1.00*				
Hersey, Mich.				.55		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas						.55
Janesville, Wis.		.65			.65@ .75	
Montezuma, Ind.			Road gravel .50 per ton			
Pine Bluff, Ark			Road gravel .50			
Rochester, N. Y	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo			Bank run gravel 1.55			
Summit Grove, Ind	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Winona, Minn.	.40	.40	.60	.60		
York, Pa.		1.00@1.20	(crushed rock sand)			

* Cubic yard. B Bank. L Lake. ‖ Ballast † Low prices, wholesale; high prices, retail.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.15	1.10
Eastern Penn. and Northern N. J.	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.50	.80	1.25	1.00	.90	.90	.90
Erie, Pa.	Crushed run slag, 4 in. and less, 1.25@1.35						
Emporium, Pa.			1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Penn.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.	All sizes, 1.50, f.o.b. Chicago						
Detroit, Mich.	All sizes, 1.65, f.o.b. Detroit						
Ironton, O.	2.05	1.45	1.80	1.45	1.45	1.45	1.45
Jackson, O.		1.35		1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.30	1.40	1.40	1.30	1.30	1.30
Steubenville, Lowellville, Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton and Low Moor, Roanoke, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50§	10.50§	10.50§	9.00		8.50	1.80
Buffalo, N. Y.				12.50				
Berkeley, R. I.			12.00					2.30
Cassadaga, N. Y.	Agricultural marl 7.00@10.00							
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
West Rutland, Vt.	13.50	12.00					11.00	3.20
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		11.50	11.50	12.50				1.85
Zylonite, Mass.	3.20d	2.90d	7.00					
CENTRAL:								
Cold Springs, Ohio		11.00	11.00				10.00	
Delaware, Ohio	12.50	11.00	10.00	11.50			10.00	1.60
Gibsonburg, Ohio	12.50		11.00		9.00	11.00	10.00	
Huntington, Ind.		11.00	10.00		8.00		9.00	
Luckey, Ohio	12.50a		10.00a		9.00			
Marblehead, Ohio		11.00	10.00				10.00	1.60
Marion, Ohio		11.00	10.00				10.00	1.60
Mitchell, Ind.				12.00	11.00		10.00	1.60
Sheboygan, Wis.								7.50d
White Rock, Ohio	12.50				9.00	11.00		
Woodville, O. (dlrs.' price)	12.50a	11.00a	10.00a		9.00		10.00	1.60
SOUTHERN:								
Erin, Tenn.							8.50	1.50
El Paso, Texas							9.00	1.50
Karo, Va.							7.00	
Knoxville, Tenn.	12.50	11.00	11.00	11.00	9.00		9.00	1.50
Ocala and Zuber, Fla.	14.00	14.00		14.00				1.75
Sherwood, Tenn.	12.50	11.00	11.00	11.00			8.50	1.50
Staunton, Va.					4.50	5.50	8.50	1.35
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							12.50	
San Francisco, Calif.	21.00	21.00	15.00	21.00			18.00	2.15*
Tehachapi, Calif.							13.00	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §paper sacks. (a) 50-lb. paper bags; terms, 30 days net, 25c per ton or 5c per barrel discount for cash in 10 days from date of invoice; (b) burlap bags; (c) 200-lb. barrels; (d) 280-lb. barrels net.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio.—Core .50@ 2.00
  Sand blast 4.50@ 5.50
  Molding fine 2.75@ 3.00
  Molding coarse 2.00@ 2.50
  Brass molding 2.50
  Furnace lining 2.00
  Molding coarse 1.75@ 2.00
  Stone sawing 1.50
  Traction .70@ 1.00
Delaware, N. J.—Molding fine 2.00
  Molding coarse 1.90
  Brass molding 2.15
Dunbar, Pa.—Traction, damp 2.50
Dundee, Ohio.—Glass, core, sand blast traction 2.50
  Molding fine, brass molding (plus 75c for winter loading) 2.00
  Molding coarse (plus 75c for winter loading) 1.75
Eau Claire, Wis.—Core 1.00@ 1.25
  Sand blast 3.25@ 3.75
Falls Creek, Pa.—Molding, fine and coarse 1.75
  Sand blast 2.00
  Traction 1.75
Franklin, Pa.—Core 2.00
  Furnace lining 2.50
  Molding fine and coarse 2.00
  Brass molding 2.00
Greenville, Ill.—Molding coarse 1.30@ 1.50
Joliet, Ill.—No. 2 molding sand and loam for luting purposes; milled .80
  Bank run .65
Kansas City, Mo.—Missouri river core .80
Kasota, Minn.—Molding fine 1.60@ 1.85
  Molding coarse, stone sawing 1.45@ 1.75
Klondike, Pacific, Gray Summit, Mo.—Molding fine and coarse 2.00
Mapleton Depot, Pa.—Furnace lining, dry 2.75
  Molding fine, damp 2.00
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp, 2.00; dry 2.75
Massillon, Ohio—Molding fine and coarse, furnace lining, core, traction 3.00
Michigan City, Ind.—Core, traction .50
Mineral Ridge, Ohio.—Core (green) 2.25
  Furnace lining, molding fine and coarse; roofing sand, sand blast, stone sawing, traction brass molding (green) 2.00
Montoursville, Pa.—Core 1.35@ 1.40
  Traction 1.00@ 1.10
  Brass molding 1.25
New Lexington, Ohio—Brass molding 2.25
  Molding coarse 2.00
Oregon, Ill.—Core 1.50@ 2.00
  Sand blast 4.00
  Stone sawing 2.00@ 2.50
Ottawa, Ill.—Core, molding coarse (crude silica sand) .85@ 1.00
Ottawa, Minn.—All crude silica sand .75@ 1.00
Rockwood, Mich.—Core 1.90@ 2.50
  Roofing 2.75
  Sand blast 3.75
Round Top, Md.—Core (damp) 1.60
  Traction (damp) 1.75
  Roofing sand 2.25

Miscellaneous Sands

(Continued)

San Francisco, Calif. (washed and dried)—Core, molding fine, roofing sand and brass molding 3.00@ 3.50
(Direct from pit)
  Furnace lining, molding coarse, sand blast 3.60
  Stone sawing, traction 2.30
St. Louis, Mo.—Red heavy molding 1.50@ 2.25
  Red fine 1.50@ 2.00
  Molding fine and brass 2.00@ 3.00
  Skein core 1.75@ 2.25
  White core sand 1.00@ 1.75
  Sand blast 2.00@ 4.50
  Furnace lining 1.50@ 2.50
  Sand blast 2.00@ 4.50
  Roofing sand 1.00@ 1.50
  Stone sawing 1.25@ 2.00
Thayers, Pa.—Core 2.00
  Furnace lining, molding fine and coarse 1.25
  Traction 2.25
Utica, Ill.—Core, furnace lining, brass molding .85@ 1.50
  Molding fine and coarse .85@ 1.50
  Roofing sand 1.75
  Sand blast 2.50
  Stone sawing 1.50@ 2.50
  Traction 1.50
Warwick, Ohio.—Core, furnace lining, molding, fine and coarse, traction, dry, 2.75; green 2.00
  Brass molding, dry 2.50
Zanesville, Ohio.—Molding fine, brass molding 1.75@ 2.00
  Molding coarse 1.50@ 1.75

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Asheville, N. C.—Best white and 200-mesh (per ton) 8.00
  Yellow (per ton) 9.00
  Red (per ton) 13.00
Baltimore, Md.—Crude talc (mine run) 3.00
  Ground talc (20-50 mesh), bags 10.00
  Ground talc (150-200 mesh), bags 12.00
  Cubes 50.00
  Blanks (per lb.) .07
Chatsworth, Ga.—Grinding 7.00
  Ground talc (150-200 mesh); bags 15.00@20.00
  Pencils and steel workers' crayons (gross) 1.50@ 2.50
Chester, Vt.—Ground talc (150-200 mesh), bulk 6.50@ 8.50
(Bags 1.00 extra)
Emeryville, N. Y.—325 mesh (double air floated), bags 14.75
Glendale, Calif.—Ground talc (150-200 mesh) 16.00@30.00
(Bags extra)
  Ground talc (50-300 mesh) 13.50@15.50
  200 mesh 13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags 18.00
Henry, Va.—Crude talc (lump mine run) per 2000-lb. ton 2.75@ 3.50
  Ground talc (20-50 mesh), bags 8.75@10.00
  (150-200 mesh), bags 9.75@12.50
Los Angeles, Calif.—Crude talc f.o.b. Silver Lake 7.00@12.00
  Ground talc (150-200 mesh), 100-200 lb. bags) 12.00@14.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk, 5.00; bags 6.00
  (150-200 mesh); bulk, 7.00; bags 8.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags 12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk 8.50@10.00
(Bags extra)
  Ground talc (150-200 mesh), bulk 10.00@22.00
(Bags extra)
Vermont—Ground talc (20-50 mesh); bags 7.50@10.00
  Ground talc (150-200 mesh); bags 8.50@15.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk 5.00
(Bags 1.00 extra)
Ground talc (150-200 mesh), bulk 8.00@14.00
(Bags 1.00 extra)
  Pencils and steel workers' crayons, per gross 1.20@ 2.00

Rock Phosphate

(Raw Rock)

Per 2240-lb. Ton

Centerville, Tenn.—B.P.L. 65% 6.00@ 8.50
  B.P.L. 65% 6.00
Gordonsburg, Tenn.—B.P.L. 68-72% 6.00@ 6.50
Tennessee—F.o.b. mines, long tons, unground Tennessee brown rock, 72% B.P.L. 7.00
Mt. Pleasant, Tenn.—Analysis, .65-70% B.P.L. (2000 lb.) 6.50
Paris, Idaho.—2000 lb. mine run, B.P.L. 70% 3.50

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	8.70	8.40	7.80
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

(Ground Rock)

Wales, Tenn.—B.P.L. 70%		7.75
	Per 2000-lb. ton	
Barton, Fla.—Analysis, 50-65% B.P.L.	3.50@	8.00
Centerville, Tenn.—B.P.L., 60-65%		6.50
B.P.L. 75% (brown rock)		12.00
Columbia, Tenn.—B.P.L. 68-72%		5.50
B.P.L. 65% (90% thru 200 mesh) bulk		5.50
Montpelier, Idaho. — Analysis, 72% B.P.L., crushed and dried		3.75
Mt. Pleasant, Tenn.—B.P.L. 65%	6.50@	7.00
Twomey, Tenn.—B.P.L. 65%		6.50

Florida Soft Phosphate

(Raw Land Pebble)

Per Ton

Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

(Ground Land Pebble)

Per Ton

Jacksonville, Fla., District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	5.95

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	22.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	23.50

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	16.00@20.00
Slate granules		7.00
Granville, N. Y.—Red slate granules		7.50
Harrisonburg, Va.—Blk. marble (crushed, in bags)		12.50
Ingomar, Ohio (in bags)	6.00@14.00	10.00@25.00
Milwaukee, Wis.		16.00@32.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsb'g, N. J.—Green stucco dash	16.00@20.00	
Poultney, Vt.—Slate granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.—(2000 lb.)		7.00@12.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags 12½c extra	4.50	4.50

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	27.00@35.00
Carpenterville, N. J.	15.00	28.00@36.00
Easton, Pa.	16.00	40.00@60.00
Ensley, Ala.	16.00	26.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	22.00	32.00
Houston, Tex.		19.50
Omaha, Neb.	18.00	30.00@40.00
Portland, Ore. (Del'd)	21.00	45.00@75.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@45.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Springfield, Ill.	18.00	20.00@25.00
Wauwatosa, Wis.	14.00@15.00	26.00@65.00
Watertown, N. Y.	21.00@22.50	35.00@37.50
Winnipeg, Can.	18.00	26.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	11.00
Boston, Mass.	15.00@16.50
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	14.00
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Rives Junction, Mich.	12.00
Saginaw, Mich.	12.00
San Antonio, Texas	13.00
San Antonio, Texas (deliv. city lts.)	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	17.00
F. o. b. cars	15.00
Washington, D. C.	14.50

Gray Clinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	23.00	20.00
Baltimore, Md.	22.00	16.25
Cincinnati, Ohio	15.80	13.30
Chicago, Ill.	18.00	18.00
Dallas, Tex.	22.50	....
Denver, Colo.	24.00	....
Detroit, Mich.	19.50	17.50
Kansas City, Mo.	25.60	24.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	21.00	21.00
New Orleans, La.	....	17.25
New York, N. Y.	16.80	13.10
Philadelphia, Pa.	15.50	14.50
St. Louis, Mo.	21.40	19.20
San Francisco, Calif.	22.00	16.00
Seattle, Wash. (paper sacks)	24.00	....

Portland Cement

Current prices per barrel in carload lots f. o. b. cars, without bags.

Atlanta, Ga.	2.80
Boston, Mass.	3.18‡
Buffalo, N. Y.	3.03‡
Cedar Rapids, Iowa	2.48
Cincinnati, Ohio	2.54
Cleveland, Ohio	2.46
Chicago, Ill.	2.20
Dallas, Texas	2.25†
Davenport, Iowa	2.43
Denver, Colo.	2.65
Detroit, Mich.	2.47
Duluth, Minn.	2.14
Indianapolis, Ind.	2.41
Kansas City, Mo.	2.45
Los Angeles, Calif. (less 5c discount)	3.26
Milwaukee, Wis.	2.37
Minneapolis, Minn.	2.39
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.83
New York, N. Y.	2.80‡
Philadelphia, Pa.	2.96‡
Phoenix, Ariz.	3.70
Pittsburgh, Pa.	2.24
Portland, Ore.	3.05
San Francisco, Calif.	3.03@3.15**
St. Louis, Mo.	2.35
St. Paul, Minn.	2.39
Seattle, Wash.	2.90*
Toledo, Ohio	2.48

NOTE—Add 40c per bbl. for bags.
**+warehouse.
‡Including sacks; 10c bbl. discount 10 days.
*10c bbl. discount.
†Bags 15c.

F.O.B. Mill Prices, Bulk

Buffington, Ind.	1.95
Cincinnati, Ohio	3.00†
Concrete, Wash.	2.60
Dayton, Ohio	2.85†
Hudson, N. Y.	2.80‡
Indianapolis, Ind.	2.96†
Los Angeles, Calif.	2.80
Louisville, Ky.	2.92†
Memphis, Tenn.	3.24†
Steelton, Minn.	1.95
Universal, Pa.	2.00

‡Includes 15c bags; will be repurchased if in good condition.
†Including cloth sacks.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	......	6.00	6.00	......	13.00	....	....	......	....	....	....	....	....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	......	21.30	20.00	20.00	....	30.00
Garbutt, N. Y.	......	......	6.00	8.00	10.00	10.00	....	7.00	....	....	....	20.00	....
Grand Rapids, Mich.	3.00	......	5.00	10.00	10.00	10.00	....	......	31.00	....	19.75	20.00	30.00
Hanover, Mont.	4.50	......	6.00	10.00	....	10.50	....	......	....	....	....	....	....
Mound House, Nev.	......	8.50	6.50	10.50@11.50	....	....	....	......	....	....	....	....	....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	......	......	10.00	11.00	11.50	....	......	33.75	....	....	....	....
San Francisco, Calif.	......	......	......	16.40	....	....	....	......	....	....	....	....	....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	....	......	....	....	28.50	....	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ‖Bulk; (a) Includes sacks.

News of All the Industry

Incorporations

The Middle Hope Sand and Gravel Co., Bronx, N. Y., has been incorporated for $10,000 by J. E. Lynch, E. Long and E. T. Carroll. The attorney is Delehanty, Giffin, Hannon and Evans, 15 Broadway.

The Welch-McGrew Cement Co., Kansas City, Mo., has been chartered for $10,000. Walsh and Aylward, Commerce building, is the attorney.

The Bedford Quarry and Mill Co., Indianapolis, Ind., has filed articles of incorporation with a capital stock of $150,000. Incorporators are R. Reed, A. H. Dunihue and R. N. Palmer.

The Genesee Stone Products Corp., Batavia, N. Y., has been incorporated for $400,000 by A. B. and N. S. and M. H. Caldwell. The attorney is Cook and Horton, Genesee.

The Orange County Rock Co., San Francisco, Calif., has been incorporated for $500,000.

The Atlas Rock Co. has been incorporated at Wilmington, Del., for $350,000.

The Neches Sand Co., Beaumont, Texas, has been incorporated for $28,000 by M. Sotrehang, E. McCarthy, Jr., and P. Boade.

The New Hope Gravel Co., Columbus, Miss., has been incorporated for $100,000 by F. Nelson, Jr., Birmingham; W. H. Rucker, J. Bena and T. W. Townsend, Columbus.

The McMillan Granite Co., Ltd., Sarnia, Ont., has been incorporated for $40,000.

The Pacific Talc and Silica Co., Ltd., Vancouver, B. C., has been incorporated for $200,000.

The Ontario Granite Co., Ltd., Winnipeg, Man., has been incorporated for $50,000 by D. W. Murray and A. E. Murray.

The Burnt River Quarries, Ltd., Toronto, Ont., has been incorporated for $100,000 by L. Wookey, G. G. Robinson and others.

The Durham Stone and Sand Co., Ltd., Toronto, Ont., has been incorporated for $500,000 and will purchase the plant of the John E. Russell Co., Ltd., Toronto.

The Consolidated Granite Co., Columbia, S. C., has been incorporated for $50,000, with C. J. Niggel, president; A. Monlinaroli, secretary.

The Industrial Sand and Gravel Co. has been incorporated in Lawton, Okla., for $60,000 by J. W. Eastman, A. Crosby and others.

The Jefferson Highway Granite Co., Sauk Rapids, Minn., has been incorporated for $200,000 by E., F. and H. Przrborowski.

The St. Charles Sand and Material Co., St. Charles, Mo., has been incorporated for $25,000 by R. Suma, J. C. Willbrand and others.

The Granite Curb Co. has been incorporated in Salisbury, N. C., for $100,000 by W. H. Ragland, Salisbury; W. T. Ragland, Raleigh, N. C., and M. N. Hedrick, Gold Hill, N. C.

The Little River Limestone Corp., Roanoke, Va., has been incorporated for $200,000 by E. W. Poindexter, president, and D. A. Kuyk, secretary.

The Pembroke Limestone Corp., Roanoke, Va., has been chartered with a capital stock of $500,000, with J. P. Woods, president, and F. W. Rogers, secretary.

Sand and Gravel

The Waukesha Washed Sand and Gravel Co., Milwaukee, Wis., has taken a long-term lease of the sand and gravel lands of H. J. Loftsgordon in the town of Burke, Wis., and will invest $50,000 in the purchase of equipment, including washing, crushing, conveying and handling machinery, all to be electrically operated. George Brew is president and general manager.

The Northwestern Sand and Gravel Co., Des Moines, Iowa, of which E. H. Lowderbaugh is manager, is having plans drawn for a $100,000 stone crushing plant to be located near Quarry, Iowa.

The Bedford-Nugent Sand and Gravel Co., Evansville, Ind., has purchased the Rockport, Ind., plant of the Evansville Sand and Gravel Co., it is announced by James Nugent, treasurer of the company. The Bedford-Nugent Co. also operates another plant at Rockport and the combined capacity will be about 40 tons a day. J. E. Wall is superintendent of both plants.

The Collister gravel pit, Terre Haute, Ind., formerly owned and operated by W. Collister, has been reopened by N. G. Wallace, F. Semour and F. Hutchinson, who is superintendent of the pit.

The Peoria Builders Supply Co., Peoria, Ill., will handle the washed sand and gravel business formerly owned and operated by the Peoria Washed Sand and Gravel Co., East Peoria, which business was purchased by the McGrath Sand and Gravel Co., Lincoln, Ill., on February 1, this year.

Louis Bernstein of New York has purchased an interest in the Price and Shipley Gravel Co. at Cache, Okla. A company is being organized to open up this gravel pit on a large scale, having at the present time contracts for about 1000 cars of gravel.

The Janesville Sand and Gravel Co., Janesville, Wis., held its annual meeting recently and all retiring directors were re-elected and they in turn re-elected the same officers.

J. S. Terry, Poteau, Ark., is arranging for the construction of 1½ miles of switch track to the pit at Spiro, Ark., where a pit will be operated to furnish gravel for road building material. Two large steam shovels have been installed and the plant will be equipped to ship about 30 cars of gravel a day.

Alvin Van Slyke, a farmer in Penn township, has investigated the possibilities for mining gravel on a ranch owned by Joshua Johnson, section 13, La Grange, Mich. The deposits extend down about 12 ft., and the gravel is pronounced by County Engineer Dana P. Smith perfect in quality.

Lime

The Hagerstown Lime and Chemical Co.'s new plant at Hagerstown, Md., is nearing completion. It will manufacture lime, fertilizers and chicken grits.

John Tiggert, New Albany, Ind., has been appointed receiver for the Marengo Limestone Co., Marengo, Ind. He will be instructed by the judge of the Circuit court of Floyd county to either operate the plant or sell it. Creditors of the company recently filed several claims against the company.

The Cajon Lime Products Co., San Bernardino, Calif., will erect a power house in connection with its proposed plant near Camp Cajon to cost $225,000 with machinery. O. E. Bricker and W. F. Warner, Riverside, Calif., head the company.

The New England Lime Co., Danbury, Conn., has been organized to manufacture lime products. It has works in Vermont, Massachusetts and Connecticut. Buildings are already erected and the company intends to do all of its work. C. E. Griffing is president; A. N. Griffing, vice-president; David Follett, secretary-treasurer.

The Raymond Pectoral Plaster Co., Glen Falls, N. Y., is taking bids on erection of a $20,000 factory building.

The Superior Lime and Hydrate Co., Pelham, Ala., has been organized, with W. D. Lewis, Jr., as president and treasurer, and H. G. Bridgewater, vice-president and secretary. The plant will have a daily output of 500 bbl. limestone products.

Woodville Lime Products Co., Woodville, Ohio, has what it believes to be the largest map in the United States; is 17 ft. long and 11 ft. wide. Every tiny village in every county in the land with railroad connections, if any, is shown.

The Bond Commission at Waynesboro, Miss., will begin work on the lime plant in Wayne county and make necessary repairs and overhauling to give the plant a worth-while capacity after holding up the work for over a year.

Phosphate Rock

The Soft Phosphate Fertliizer Co. has been incorporated in Tampa, Fla., for $300,000. W. M. Brooks, president; S. Borchardt, secretary.

The Calcium Phosphate and Fertilizer Corp., Richmond, Va., has preliminary plans for the installation of additional equipment at its plant.

The Southern Phosphate Corp. of New York has purchased about 5000 acres of land in what is known as the Panway district of Polk county, Bartow, Fla., for a consideration of $991,500.

Quarries

The Watertown Stone Products Co., Watertown, N. Y., is expanding its plant. New equipment is being installed and buildings are being erected. The company has sent a sample of its brick to the Bureau of Standards for a standard test.

The Worlock Stone Crushing plant near Perryville, N. Y., was completely destroyed by fire of unknown origin. The loss is estimated at $100,000, mostly covered by insurance.

The American Crushed Rock Co., Los Angeles, Calif., recently incorporated for $450,000, has organized with A. H. Hoffman, Azusa, Calif.; W. J. Flynn, C. A. McElroy, A. M. Hoefner, J. A. Care, Los Angeles.

The Cleveland Stone Co. and the Ohio Quarry Co., Lorain, Ohio, announces a 5 to 7½ per cent wage increase affecting 700 men. Employes of both concerns recently went on strike for higher pay.

The Astoria Crushed Rock Co., Portland, Ore., has increased its capital stock from $3600 to $36,000

The Kirschmann Stone Quarry, Mt. Penn, Pa., the property of the city, will be sold. The quarry property was acquired by the city last year through condemnation proceedings. The reason for purchasing the property being the desire of the council to save the mountain slope from further defacement due to removal of sand and stone. A stone crusher and other machinery will be sold by the city. The quarry of the Reading Stone Co., which the city is also endeavoring to secure for the same reasons, is still under litigation.

The Buchanan County Quarry Co., St. Joseph, Mo., tested its rock crusher by the 60-hp. tractor engine that will operate the machinery. The crusher has a 500-ton capacity per day. Operations are expected to start within a short time. Several hundred feet of steel trackage is on the ground to be laid for the narrow gage cars to transport the rock from the quarry to the crusher.

The Universal Magnesite Products Co., Escanaba, Mich., has begun the erection of a frame and stucco factory building, 40x140 ft.

The Truswall Stone Co., Kansas City, Kans., of which F. F. Frehbiel is superintendent and E. A. Wetzee manager, will erect a $35,000 plant here.

The Basin Quarries, Inc., Portland, Me., organized with a capital of $100,000, has plans under way for the erection of a new feldspar, quartz and mica plant, with pulverizing, screening and grinding departments, estimated to cost $50,000 with machinery. The mill will have an initial capacity of 30 tons per day. Joseph F. Perry is president and Frank L. Marston, vice-president.

The Aquia Creek Quarries Corp., Fredericksburg, Va., recently organized to operate sandstone quarries in this section, will install a complete mining plant, industrial railroad, etc., at its local properties, estimated to cost $55,000. Arthur Middletown, Victor building, Washington, patent attorney, is secretary and treasurer.

The Oliver Mining Co. has let the contract to the Henry Hegner Construction Co., Appleton, Wis., for erecting a large mill for crushing stone for making roofing material, at Iron Mountain, Mich. It will cost about $100,000 complete.

Cement

The Texas Portland Cement Co., Dallas, Texas, has commenced the construction of an addition to its plant No. 2 at Manchester, near Houston, to cost close to $100,000, of which about $60,000 will be used for grinding and other machinery. William Moeller is superintendent.

The State Cement Commission of South Dakota, of which A. C. Hunt, Rapid City, is secretary, has let the general contract for the erection of five buildings at the state cement plant to cost $400,000.

The Lehigh Portland Cement Co., Allentown, Pa., has increased its capital stock from $18,000,000 to $25,000,000.

The Sulphide Corporation, Ltd., will establish cement works at Cockle Creek, New South Wales, Australia. Construction on the first unit, which

(Continued on page 66)

Cement

will have a capacity of 30,000 tons a year, will start at once. This plant will probably be duplicated later on, Trade Commissioner J. W. Sanger, Melbourne, Australia, reports to the Department of Commerce.

The Great Western Portland Cement Co. is making progress on its large storage plant at Mildred, Kans. The building consists of six concrete tanks 32 ft. each in diameter and, when completed, each will be 82 ft. high above the base. The tanks rest on one complete concrete base, and each tank has an outlet at the bottom and can be emptied by gravity into cars which will run under the base. The concrete in the walls of the tanks is reinforced by iron rods about 2 in. apart. In these tanks concrete ready for the final grind and sacking will be stored.

The Ash Grove Lime and Portland Cement Co., Kansas City, Mo., were hosts of the Kiwanis Club at a dinner given at its plant at Chanute and later were taken through an inspection tour of the company's new power plant and other departments.

The San Joaquin Portland Cement Co., it is reported in the Los Angeles "Times" May 12, expects to start construction work on its plant near Exeter, Calif., within 10 days from that date. The company has been formed with a capitalization of $4,000,000. Plans call for expending from $1,500,000 to $2,000,000 on the plant. Its capacity will be 2000 bbl. of cement per day. The company will also manufacture lime.

The Kosmos Portland Cement Co., Kosmosdale, Ky., has been granted a reduction on cement rates by the State Railroad Commission from Kosmosdale to Dawson Springs during the period of construction of the Disabled Veterans' Hospital from 16½ cents to 13 cents, and fixed the future rate at 11 cents.

Agstone

H. W. Warner of the soils extension at Iowa State College announces that limestone inspection tours, for the purpose of encouraging the general adoption of good soil improvement methods, will be conducted under the leadership of the county agents in 22 Iowa counties between the middle of May and June 15. This is the first time such a series of tours has been held in Iowa. A soils extension man from Iowa State College will be with each party to explain the meaning of the demonstrations and to answer questions. The test fields will be fully labeled so that visitors may know at a glance which plots have received lime or fertilizer and which ones have not.

Glenn S. Hensley, county agent, at a meeting of farmers held at Eagleville, Mo., decided to form a stock company and purchase the Allhain and Davis crusher, which has been operating for some time on Shain Creek. The crusher will be operated at the same place and will furnish broken rock for road building, also rock as fertilizer upon farms.

The County Farm, Montezuma, Iowa, recently secured a car of Marshall county stone and some of the load has already been scattered on the land and results will be watched with interest by many farmers throughout the county. The Marshall county quarry, because of its nearness to Poweshelk, will supply the limestone used by farmers in this district.

W. F. Delp, county farm agent, believes from 5000 to 6000 tons of lime are expected to be spread over Greene county farms this fall and winter. Much interest is being shown in this locality concerning the increased yields which result from land being "resoiled" with this material.

Gypsum

The United States Gypsum Co., Chicago, Ill., has declared regular quarterly dividend of 1 per cent on the common and 1¾ per cent on the preferred stocks. Dividends are payable June 30, to stock of record June 15.

Standard Gypsum Co., manufacturers of standard plaster for hardwall, finishing and casting purposes, has opened a southern California sales offices at 341 Citizens National Bank building, under the management of F. O. Toribio. The company's mills are at Ludwig, Nev., where it has a large deposit of gypsum.

The National Gypsum Products Co., Alamogordo, N. M., has filed articles of incorporation with an authorized capital of $750,000, divided into 750,000 shares of $1 par value—600,000 shares of common and 150,000 of preferred. It begins business with $2000 subscribed. The incorporators are E. F. Hoegerman, Los Angeles; P. M. Holaday, Tacoma; S. C. Rundle, Los Angeles, and J. E. Fetz, Alamogordo.

The U. S. Gypsum Co., Chicago, Ill., reports it is doing the greatest volume of business in its history. Shortage of labor has been in evidence since February and considerable difficulty is experienced in obtaining sufficient labor to supply the different plants of the company throughout this country. Although there has been of late quite an inflow of Canadian labor, which has helped to relieve the strain to a considerable extent, present wages paid by the company are slightly higher than those which prevailed at the peak of the season' following the war. Prices of materials were lower in 1922, compared with 1921, while the prevailing prices of 1923 are lower than in 1922.

Concrete Products

The Dodson Cement Products Co., Wichita, Kans., may build and operate a branch plant at Blackwell, Okla. It will sell some preferred stock at Blackwell, to help build the plant. The industrial committee of the Commercial Club is investigating the proposition.

The Shope concrete brick manufactured by the Warren Sand and Gravel Co., Easton, Pa., is made as set by U. S. brick standards. It is slightly larger than the average brick and means a saving of 10 per cent in the number of bricks used in comparison with the average brick.

The Tonawanda Roofing Co., Tonawanda, N. Y., has been incorporated for $10,000 by T. Hefferman, H. O'Hagan. H. E. Collins, Buffalo, attorney.

The Barnesville C[illegible] Products Co., Barnesville, W. Va., has started operating. It manufactures building blocks ranging from the common to the better grades. Both machine and hand-made blocks will be made.

The West End Cement Block Corp., Brooklyn, N. Y., has been incorporated for $10,000. Directors, B. Danzig, M. Labianeo, Brooklyn, A. A. Sarafan, Manhattan.

M. G. Hamilton, Burlington Junction, Mo., will operate a concrete block factory soon. The machinery has been ordered.

The Harrisburg Building Block Co., Harrisburg, Pa., has acquired three acres of land at Cameron and Reily streets for the erection of a new one-story plant, 92x130 ft., for the manufacture of concrete blocks and kindred specialties. T. F. Bausman is one of the heads of the company.

The National Concrete Block Corp. of Delaware, Pittsburgh, Pa., has acquired property, 200x225 ft., on Westhall street for the establishment of a new plant to manufacture concrete blocks and kindred products. J. W. Magee is interested in the company, which was recently organized.

The Ornamental Stone Co., 129 Brevard court, Charlotte, N. C., will commence the erection of a new plant, 75x300 ft., for the manufacture of precast stone products. Mixing and grinding machinery, molding apparatus and other equipment will be installed. W. F. McCanless is president, and C. J. Helms, secretary and treasurer, in charge.

The Cinder Block Corp. is being formed by C. P. Minning and will incorporate with a capital stock of $100,000, to operate a plant at Baltimore, Md., to manufacture blocks for building construction. The plant will have a capacity of 600,000 bricks a year. The cinder products industry is spreading rapidly throughout the country. Nearly 40 plants have been licensed and are in operation or in process of construction, including Chicago, Philadelphia, Camden, Wilmington, Lancaster and York, Pa.; Warren and Youngstown, Ohio, and Richmond, Va.

The Buckeye Tile Co., an Eastern firm, will open a plant at Chillocothe, Ohio, to manufacture floor tiling.

The Loftis-Christofoli Tile Co. has filed articles of incorporation to operate a plant at Birmingham, Ala., to manufacture tile, terrazo, marble and mosaic tile by V. P. Loftis, P. A. Christofoli and E. H. Loftis.

The Quality Concrete Products Co. has been incorporated at Wilmington, Del., for $30,000.

The Maryland Fireproofing Co., 10 South street, Baltimore, Md., has been incorporated for $10,000 by C. W. Perkins, A. A. Levin and J. Sherbow.

The Seaboard Concrete Products Co., Great Neck, N. Y., has been incorporated for $25,000 by E. Cudlip, E. Breuer and S. A. Sahm. The attorney is W. C. Roe, Jamaica.

The Nepperhan Concrete Products Corp., Yonkers, N. Y., has begun operations at its plant at Sprain and Tuckahoe roads. The company was organized a short time ago and has just completed the installation of its machinery, bins, etc. The machinery used in sifting, grading and washing the sand and gravel is of the most modern type, capable of turning out large quantities every day. E. M. Morales is secretary and general manager of the company.

The Sarnia Cement Products, Ltd., Pt. Edward, Ont., is rebuilding its plant, recently destroyed by fire. It will also have three drying kilns.

Silica Sand

The Fort Smith Chemical Co., Fort Smith, Ark., will operate a chain of four plants to manufacture byproducts of silica rock. The first of these plants is the mill at Mustin, Okla., which has already started operating with a 100-ton daily capacity. Other mills will be a salt works at Osage county, Oklahoma, a hydro-chloric acid plant and a salt cake plant at Ft. Smith. The company will also handle a laboratory products business.

Manufacturers

W. C. McDowell, formerly manager of the mining sales department, power and mining machinery works of the Worthington Pump and Machinery Corp., has accepted the position of general sales manager of the Traylor Engineering and Mfg. Co., Allentown, Pa.

The Link-Belt Co.'s Pittsburgh branch office has moved from 1501 Park building to its new and more commodious offices at 335 Fifth avenue. Mr. T. F. Webster, manager of the Pittsburgh office, says that larger space and the more convenient location was imperative because of the volume of business transacted during the past year.

The Evinrude Motor Co., Milwaukee, by the use of one of its centrifugal pumps, say the Duluth daily papers, saved the little town of Central Lakes, Minn., from fire. Forest fires had been threatening this village of 150 inhabitants for some time, but by consistent back-firing it had been saved. Upon this occasion a sawmill outfit had just been burned out and the fire was moving toward the main section of the village. The Evinrude pump was brought through three miles of flaming roadway by two National Guardsmen. It was lowered into a cistern under the parlor floor of one of the Central Lakes homes and the stream of water which it threw on the fire, together with the efforts of a bucket brigade, succeeded in halting the progress of the flames.

Trade Literature

"A Better Pump for Any Service" is the title of a four-page folder recently gotten out by the Traylor Engineering and Mfg. Co., Allentown, Pa., describing its Superpump. It is built in the triplex and quintuplex types for any pressure and for any number of gallons per minute. "No matter what your needs may be, there is a Superpump that will meet your needs," says this company.

Underground Shovel—Bulletin 103, issued by the Hoar Shovel Co., Duluth, Minn., is "an idea of what has been done toward eliminating hand loading underground." This company's "baby" shovel has been named for Captain Hoar, who has been in charge of underground mines for nearly 50 years. The applications of the shovel are shown in the illustrations, with a close-up of its mechanism and detailed drawings. The operation details are also described, the performance data given, and a special engineering service offered.

Eliminating Risk and Waste—The Keystone Lubricating Co., Philadelphia, Pa., is distributing an illustrated folder describing the Keystone manifold safety lubricator as a means of applying its grease under high pressure with pipe-line distributions to more than one bearing. This result is said to be accomplished without risk to the operator or waste of grease. Bearings that are difficult of access due to small clearances between working parts, heat, and other unfavorable conditions, are made easy to reach by this medium of lubrication, says the bulletin. The illustrations show the manifold safety lubricator, its method of operation, its use in cement and other plants, etc.

Centrifugal Acid Pumps and Valves—Bulletin No. 15 of the Chemical Equipment Co., Chicago, illustrates and describes its centrifugal acid pumps and priming systems "that pass the acid test." Included are diagrams for this pump when handling water at various temperatures, general pump data, performance curves, and a table showing friction of water in pipes. Bulletin 16 describes the Ceco acid valves for corrosive liquids.

Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in this issue of Rock Products

AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AIR COMPRESSORS
Worthington Pump & Mach. Corp., New York City, N. Y.

AIR SEPARATORS
Gay Co., Rubert M., New York City, N. Y.

AUTOMATIC WEIGHERS
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

BAGS AND BAG MACHINERY
Jaite Co., The, Jaite, Ohio.
Valve Bag Co. of America, Toledo, Ohio.

BALLS (Tube Mill, etc.)
Fuller-Lehigh Co., Fullerton, Pa.

BELTING
New York Belting and Packing Co., New York City.
Robins Conveying Belt Co., New York City, N. Y.

BELT FASTENERS
Crescent Belt Fastener Co., New York City, N. Y.

BINS
Austin Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill. (storage)

BIN GATES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bacon, Earle C., Inc., New York City.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webster Mfg. Co., The, Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

BOILERS
Edge Moor Iron Co., Edge Moor, Del.

BLASTING SUPPLIES
Atlas Powder Co., Wilmington, Del.
Ensign-Bickford Co., Simsbury, Conn.
Grasselli Powder Co., Cleveland, Ohio.

BRICK MACHINERY
Shope Brick Co., Portland, Ore.

BUCKETS—Elevator
American Manganese Steel Co., Chicago Heights, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.
Webster Mfg. Co., The, Chicago, Ill.

BUCKETS
Industrial Works, Bay City, Mich.
Jeffrey Mfg. Co., Columbus, Ohio.
McMyler Interstate Co., Cleveland, Ohio.
Penn Fdy. & Mfg. Co., Reading, Pa.
The Byers Machine Co., Ravenna, Ohio.

CABLEWAYS
Interstate Equip. Co., New York, N. Y.
Link-Belt Co., Chicago, Ill.
McMyler Interstate Co., Cleveland, Ohio.

CALCINING MACHINERY
Ehrsam & Sons Co., J. B., Enterprise, Kans.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

CARS—Quarry and Industrial
Easton Car & Constr. Co., Easton, Pa.
Koppel Industrial Car and Equipment Co., Koppel, Pa.
Penn Fdy. & Mfg. Co., Reading, Pa.
Worthington Pump & Mach. Corp., New York City, N. Y.
Western Wheeled Scraper Co., Aurora, Ill.

CAR PULLERS
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CHAIN
Carroll Chain Co., The, Columbus, Ohio.
Morse Chain Co., Ithaca, N. Y.

CLUTCHES
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., The, Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CONVEYORS AND ELEVATORS
Austin Mfg. Co., Chicago, Ill.
C. G. Buchanan Co., Inc,, New York City, N. Y.
Caldwell, H. W., & Son Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, Ohio.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Sturtevant Mill Co., Boston, Mass.
Toepfer & Sons Co., W., Milwaukee, Wis.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., The, Chicago, Ill.

CRANES—Crawler
Industrial Works, Bay City, Mich.

CRANES—Locomotives
Byers Machine Co., Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Koehring Co., Milwaukee, Wis.
Link-Belt Co., Chicago, Ill.
McMyler-Interstate Co., Cleveland, Ohio.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.
Northwest Engineering Co., Chicago, Ill.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Bacon, Earle C., Inc., New York, N. Y.
Buchanan Co, Inc., C. G., New York, N. Y.
Ehrsam & Sons Co. J. B., Enterprise, Kan.
Fuller-Lehigh Co., Fullerton, Pa.
Good Roads Machinery Co., Kennett Square, Pa.
Jeffrey Mfg. Co., Columbus, Ohio.
K. B. Pulverizer Co., New York, N. Y.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Morgan Engineering Co., The, Alliance, Ohio.
New Holland Machine Co., New Holland, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Robins Conveying Belt Co., New York City, N. Y.
Smidth & Co., F. L., New York, N. Y.
Smith Eng Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Webb City & Carterville Fdy. and Mach. Wks., Webb City, Mo.
Worthington Pump & Mach. Corp., New York City, N. Y.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.

DERRICKS
American Hoist & Derrick Co., St. Paul, Minn.
The Byers Machine Co., Ravenna, Ohio.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.

DREDGES—Bucket and Elevator Type
Ellicott Machine Corp., Baltimore, Md.
Osgood Company, Marion, Ohio.

DRILLS
Armstrong Mfg. Co., Waterloo, Iowa.
Howells Mining Drill Co., Plymouth, Pa.
Sanderson Cyclone Drill Co., Orrville, Ohio.

DRYERS
American Process Co., New York City.
McGann Mfg. Co., York, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.
Worthington Pump & Mach. Corp., New York City, N. Y.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Gay Co., Rubert M., New York City, N. Y.

DYNAMITE
Atlas Powder Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.

ENGINES (Gasoline and Kerosene)
Climax Engineering Co., Clinton, Iowa.

ENGINES—Steam
Ellicott Machine Corp., Baltimore, Md.
Morris Mach. Works, Baldwinsville, N. Y.

ENGINES—Oil
Power Mfg. Co., Marion, Ohio.

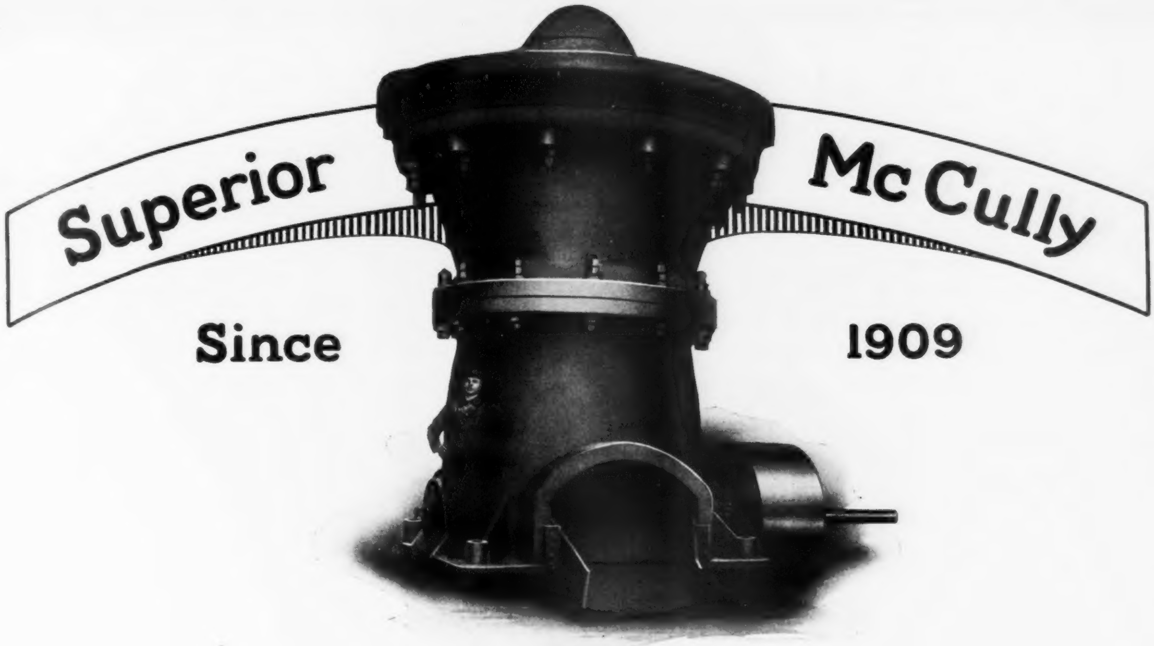
ENGINEERS
Bacon, Earle C., Inc., New York, N. Y.
Buchanan Co., C. G., Inc., New York City.
Ehrsam & Sons Co., J. B., Enterprise, Kans.
Meade & Co., Richard K., Baltimore, Md.
R. W. Hunt & Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., The, Chicago, Ill.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Northwest Engineering Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.

FUSES (Detonating and Safety)
Ensign-Bickford Co., Simsbury, Conn.

GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.



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The Original Superior McCully

In 1909 Worthington built the first short shaft gyratory called the Superior McCully Crusher as distinguished from the standard McCully. Thus the present style of gyratory crusher built at the Power and Mining Works of the Worthington Pump and Machinery Corporation has a background of fourteen years.

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Executive Offices: 115 Broadway, New York City. Branch Offices in 24 Large Cities

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Blake & Knowles Works
East Cambridge, Mass.
Worthington Works
Harrison, N. J.
Laidlaw Works, *Cincinnati, Ohio.*

Gas Engine Works, *Cudahy, Wis.*
Power & Mining Works
Cudahy, Wis.
Snow-Holly Works
Buffalo, N. Y.

Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in this issue of Rock Products

GEARS
American Manganese Steel Co., Chicago Heights, Ill.
Caldwell, H. W., & Son Co., Chicago, Ill.
Falk Corp., The, Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, Ohio.
Link-Belt Co., Chicago, Ill.

GENERATORS
Burke Electric Co., Erie, Pa.

GREASE
Keystone Lubricating Co. The, Philadelphia, Pa.

GRIZZLIES
Robins Conveying Belt Co., N. Y. City, N. Y.

GYPSUM-PLASTER PLANTS
J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kan.

HOISTS
American Hoist & Derrick Co., St. Paul, Minn.
Link-Belt Co., Chicago, Ill.
The Byers Machine Co., Ravenna, Ohio.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

HOSE—Water, Steam, Air Drill, Pneumatic Tool
New York Belting and Packing Co., New York City.

HOSE APPLIANCES
Knox Mfg. Co., Philadelphia, Pa.

HYDRATING MACHINERY
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Kritzer Co., The, Chicago, Ill.
Meade & Co., Richard K., Baltimore, Md.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

HYDRAULIC DREDGES
Ellicott Machine Corp., Baltimore, Md.
Morris Machine Works, Baldwinsville, N. Y.

INSULATION—Heat
Celite Products Co., Chicago, Ill.

LIME HANDLING EQUIPMENT
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., The, Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

LIME KILNS
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Hendrick Mfg. Co., Carbondale, Pa.
McGann Mfg. Co., York, Pa.
Meade & Co., Richard K., Baltimore, Md.
Vulcan Iron Works, Wilkes-Barre, Pa.
Worthington Pump & Mach. Co., N. Y. City, N. Y.

LIQUID FUEL EQUIPMENT
Best Furnace & Burner Corp., W. N., New York City, N. Y.

LOADERS AND UNLOADERS
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Jeffrey Mfg. Co., Columbus, Ohio.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Davenport Locomotive Wks., Davenport, Iowa.
Fate-Root-Heath Co., Plymouth, Ohio.
Porter Co., H. K., Pittsburgh, Pa.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Ironton Engine Co., Ironton, Ohio.
Lima Locomotive Works, New York, N. Y.
Milwaukee Locomotive Mfg. Co., Milwaukee, Wis.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

LOCOMOTIVE CRANES
McMyler Interstate Co., Cleveland, Ohio.

LUBRICANTS
Keystone Lubricating Co. The, Philadelphia, Pa.

MANGANESE STEEL
American Manganese Steel Co., Chicago Heights, Ill.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.

MILLS (Grinding, etc.)
Fuller-Lehigh Co., Fullerton, Pa.
Sturtevant Mill Co., Boston, Mass.

MOTORS, ELECTRIC
Burke Electric Co., Erie, Pa.

PERFORATED METALS
Cross Eng. Co., Carbondale, Pa.
Harrington & King Perforating Co., The, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

PLASTER MACHINERY
Ehrsam & Sons Co., J. B., Enterprise, Kans.

PORTABLE CONVEYORS
Jeffrey Mfg. Co., Columbus, Ohio.
Link-Belt Co., Chicago, Ill.

POWDER
Atlas Powder Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.

PULLEYS
Weller Mfg. Co., Chicago, Ill.

PULVERIZED FUEL EQUIPMENT
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Ellicott Machine Corp., Baltimore, Md.
Evinrude Motor Co., Milwaukee, Wis.
Morris Machine Works, Baldwinsville, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Worthington Pump & Mach. Corp., New York City, N. Y.

PUMP VALVES
New York Belting and Packing Co., New York City.

QUARRY EQUIPMENT
Universal Road Mach. Co., Kingston, N. Y.

ROAD MACHINERY
Austin-Western Road Machy. Co., Chicago, Ill.
Good Roads Machinery Co., Kennett Square, Pa.

SCRAPERS, DRAG
Austin-Western Road Mchy. Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

SCREENS
Austin Mfg. Co., Chicago, Ill.
Buchanan Co., Inc., C. G., New York City, N. Y.
Cross Eng. Co., Carbondale, Pa.
Harrington & King Perforating Co., The, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Newark Wire Cloth Co., Newark, N. J.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Toepfer & Sons Co., W., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Tyler Co., The, W. S., Cleveland, Ohio.
Universal Road Mach. Co., Kingston, N. Y.
Universal Vibrating Screen Co., Racine, Wis.
Webster Mfg. Co., The, Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SEPARATORS
Gay Co., Rubert M., New York City, N. Y.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Tyler Co., The W. S., Cleveland, Ohio.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York, N. Y.

SHEAVES
American Manganese Steel Co., Chicago Heights, Ill.
Gay Co., Rubert M., New York City, N. Y.
Weller Mfg. Co., Chicago, Ill.

SHOVELS—Steam, Electric and Gas
Bucyrus Co., South Milwaukee, Wis.
Erie Steam Shovel Co., Erie, Pa.
Hoar Shovel Co., Duluth, Minn.
Marion Steam Shovel Co., Marion, Ohio
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.
Thew Shovel Co., Lorain, Ohio.

SPROCKETS AND CHAIN
American Manganese Steel Co., Chicago Heights, Ill.
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

STEEL PLATE CONSTRUCTION
Hendrick Mfg. Co., Carbondale, Pa.

TANKS, STEEL STORAGE
Traylor Eng. & Mfg. Co., Allentown, Pa.

TESTING SIEVES AND SHAKERS
Tyler Co., The W. S., Cleveland, Ohio.

TRACK EQUIPMENT
Central Frog & Switch Co., Cincinnati, Ohio.
Easton Car & Constr. Co., Easton, Pa.
Koppel Ind. Car & Equip. Co., Koppel Pa.

TRANSFORMERS
Burke Electric Co., Erie, Pa.

TRANSMISSION MACHINERY
Falk Corp., The, Milwaukee, Wis.
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

VALVE COUPLINGS
Knox Mfg. Co., Philadelphia, Pa.

WASHERS, SAND AND GRAVEL
Link Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

WEIGHING EQUIPMENT
Richardson Scale Co., Passaic, N. J.

CROSS ENGINEERING CO. CARBONDALE, PA.
CE
PERFORATED SHEET METALS

PERFORATED STEEL SCREENS..

You can always get a better understanding of the advantages of Cross Perforated Steel Screen if you will talk to users.

There are hundreds and hundreds of them and the service they enjoy is uniformly excellent.

500 tons or more of steel plates and sheets are carried in stock. This enables us to fill rush orders promptly.

Repair and renewal parts supplied quickly and correctly.

Write for prices and information

Cross Engineering Company, Offices and Works, Carbondale, Pa.

Every Milwaukee Locomotive Is a Profit Builder

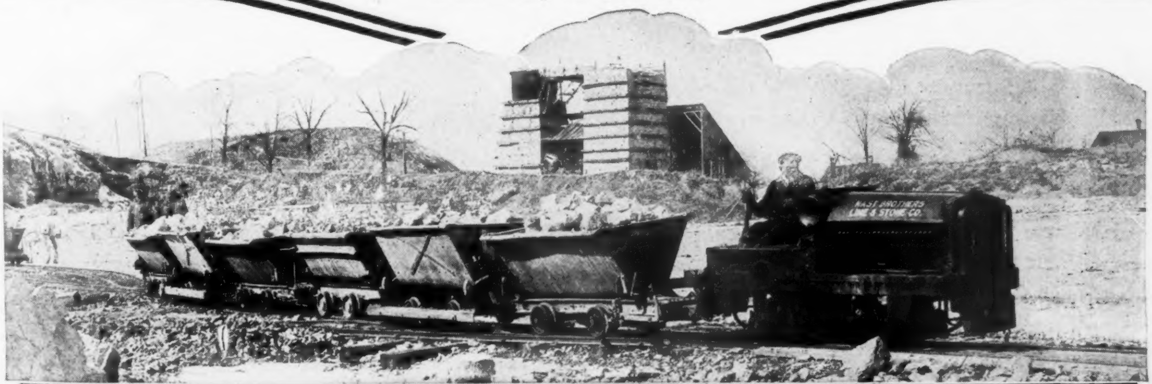
And that's only one of the many reasons why Milwaukee Gasoline Locomotives are now being so generally adopted in the quarry, and general industrial field.

There's a type and size of Milwaukee Gasoline Locomotive for every class of haulage, and each and every one is sold on a positive guarantee based on actual performance.

You simply can't go wrong with a Milwaukee on the job

Publication O-121 tells all about them. Write for a copy to-day—NOW!

MILWAUKEE LOCOMOTIVE MFG. CO.
Milwaukee, Wis., U. S. A.



MILWAUKEE GASOLINE LOCOMOTIVES

Since the Days of Watt

the harnessing of heat has developed to a degree never dreamed of in his time. This is an age of accomplishment through heat. Heat drives the wheels of industry, makes transportation possible, and gives to the world the manifold refinements of modern civilization.

¶ Industry cannot live without heat, and economical production is the dominating motive of industry. In the conservation and utilization of heat for productive work, no one material has performed such important service as

SIL-O-CEL

TRADE MARK REGISTERED U.S. PATENT OFFICE

HEAT INSULATION

¶ SIL-O-CEL holds heat at such extreme temperatures that other forms of insulation disintegrate and become worthless. No other known material possesses such low conductivity. Saving from 60 to 70 per cent of the heat lost by radiation, SIL-O-CEL pays for itself in fuel saving within a year. Being permanent, it continues to save fuel throughout the life of equipment.

¶ Four convenient forms—brick, block, powder and cement—make it adaptable to all high temperature equipment without change in design.

Write nearest office for Bulletin S-95 giving detailed information.

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Offices and Warehouses in Principal Cities
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AMSCO MISSABE DIPPER

Keen economists know that price can never be the sole determining factor in estimating value. Price is much or moderate only when it is considered in relation to the quality of the product to which it is attached.

The Missabe is backed by the trade name AMSCO and the significance of AMSCO is a **Steel For Service,** the strongest and most enduring metal known when applied to a service demanding high resistance to breakage and wear.

The use of a Missabe Dipper means your quarry operation will reach a maximum of efficiency.

Clark Reversible Teeth

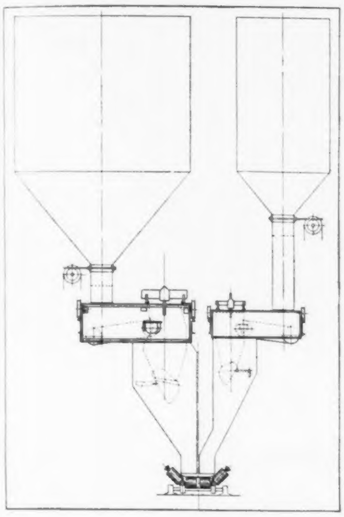
are simple in construction. Point can be removed or renewed by removing the wedge type bolt. The point will not wear loose or drop off.

We have a liberal exchange proposition on dipper teeth you should know about.

American Manganese Steel Co.
398 E. 14th St. Chicago Heights, Ill.
Foundries: Chicago Heights, Ill.; New Castle, Del., and Oakland, Cal.

For Better Proportioning of Ingredients in the Manufacture of Cement

Use Richardson Combined Mixing Scales



Two or more scales, as required, yoked together by electrical gear, consisting of a lever system, operated by solenoids, set so that all scales dump simultaneously into a common hopper.

The proportioning of limestone and shale, or clinker and gypsum is exceedingly accurate and continuity of mix is assured.

A thoroughly tested combination, ruggedly built for continuous service.

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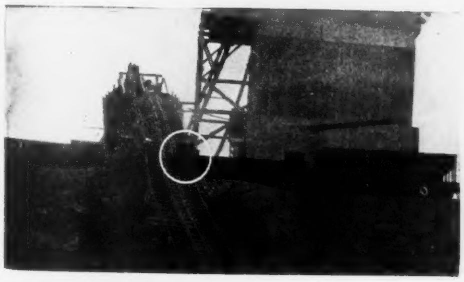
EASTON QUARRY CARS



TYPE 5968

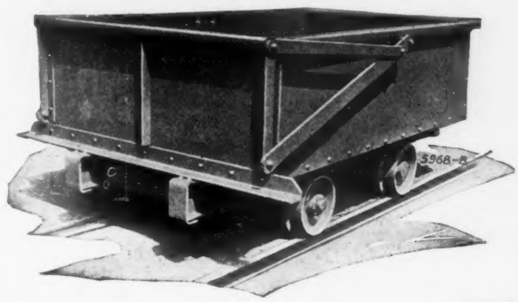
A splendid and popular type of End Door Rear End Dump Quarry Car. Suitable for hand loading. Capacity 3½ tons—gauge 36"—over all height 3' 3 .

EASTON INDUSTRIAL CARS

"Quarry Car Practice"

Part four is now being distributed. Contains over 50 pictures, taken in quarries, making a total of over 200 pictures so far shown in this interesting series of bulletins.

In Bulletin No. 21 are shown 39 other pictures of quarry cars. No matter how large or how small or what type of quarry car or mine, clay bank or sand pit car you wish we have it. You will find it pays to purchase your cars from a firm that has a large and varied experience in these lines.



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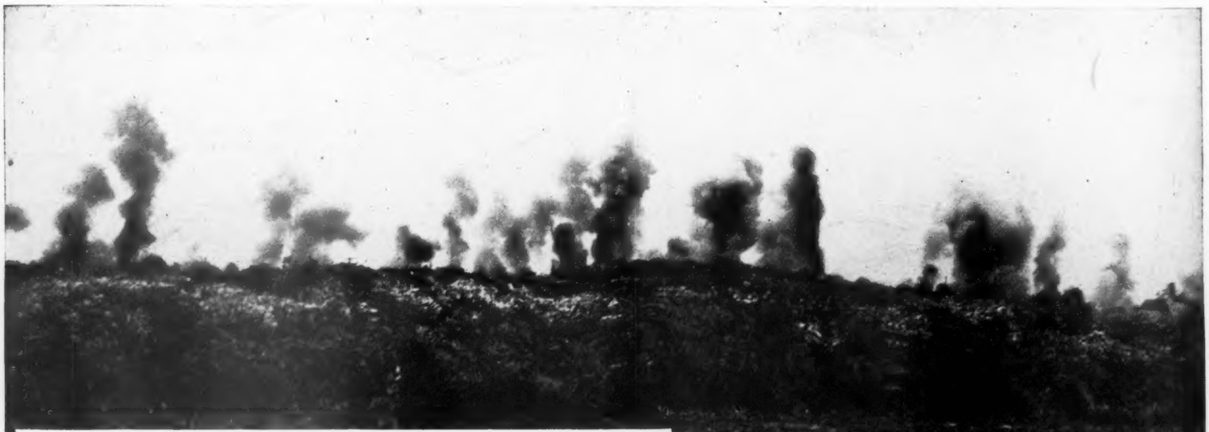

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EXPLOSIVES
for quarrying

ALTHOUGH large quantities of Atlas Ammite are used because it will not freeze under any condition, this Atlas product is more than a winter explosive. It is an all-year-round standby with quarry men—an explosive that is equally efficient, powerful and economical at any season of the year. Furthermore, Atlas Ammite will not cause headaches even when handled in enormous quantities. It keeps indefinitely under proper storage conditions—age has no harmful effect upon it. Let the Atlas Service Man show you how Ammite can be made to cut blasting costs on *your* work. Write nearest branch.

AMMITE
—the all-year-round explosive—

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HERRINGBONE GEARS

Falk Herringbone Ball Mill Gears—17 and 267 teeth; 2 D. P., 16 inch face

Safeguarding Your Investment In Power

Power is what you buy when you invest in a piece of machinery—or when you invest in equipment designed to distribute the power generated by that machinery.

Safeguard your investment in power by installing Falk Herringbone Gears for the transmission of power—on grinding and pulverizing machinery, such as tube mills, ball mills, conical mills, etc., and on hoists, compressors and centrifugal pumps.

Consult our engineering department

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Milwaukee, Wisconsin

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Vulcan Iron Works, Wilkes-Barre, Pa.

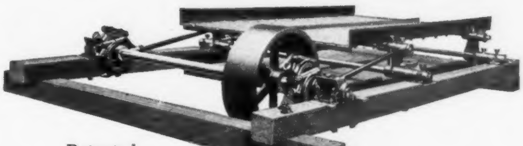
General Machinery Co., Brown Marx Bldg., Birmingham, Ala.

Denver Engineering Works, Denver, Colo.

Engineering Equipment Co., Ltd., 358 Beaver Hall Sq., Montreal, Quebec, Canada.

Foreign Representatives: Gustav Melms, 3 Rue Taitbout, Paris

ALLIS-CHALMERS
COMPENSATED TYPE SHAKING SCREEN



Patented

Allis-Chalmers Products

Electrical Machinery
Steam Turbines
Steam Engines
Condensers
Hydraulic Turbines
Pumping Engines
Centrifugal Pumps
Gas Engines
Oil Engines
Mining Machinery
Metallurgical Machinery
Crushing and Cement Machinery
Flour Mill Machinery
Saw Mill Machinery
Air Compressors
Air Brakes
Steam and Electric Hoists
Farm Tractors
Power Transmission Machinery
Perforated Metal
Timber Treating and Preserving Machinery

You will find the same ruggedness in "Allis-Chalmers" Screening equipment as found in all of their products, the result of a half century of experience. The durability, simplicity and efficiency of the "Allis-Chalmers" Compensated Type Shaking Screen is unequalled by any other screen on the market.

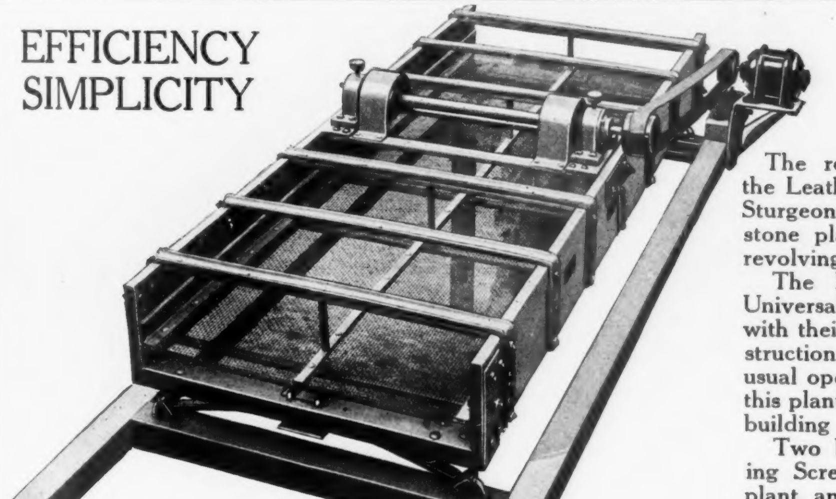
By balancing one screen against the other, much of the vibration in the frame and building is eliminated. Up-to-date commercial limestone and gravel plants realize the vital importance of installing shaking screens, permitting the production of smaller stones to meet the market requirements.

Write for further information

ALLIS-CHALMERS MANUFACTURING CO.
MILWAUKEE, WIS. U.S.A.
District Offices in all principal cities

UNIVERSAL VIBRATING SCREENS

EFFICIENCY
SIMPLICITY



The recently constructed plant of the Leathem D. Smith Stone Co. near Sturgeon Bay, Wis., is one of the few stone plants in the world having no revolving screens.

The high screening efficiency of Universal Vibrating Screens, combined with their simplicity in design and construction has not only made this unusual operation possible, but has made this plant a pattern which will be used in building scores of plants in the future.

Two batteries of Universal Vibrating Screens are in use at the Smith plant, and the seven screens they comprise are demonstrating daily their great value.

Furnished with or without motors.

Let us send you our booklet illustrating and describing this revolutionary product

Universal Vibrating Screen Co.
1530 Packard Avenue **Racine, Wis.**

GAYCO EMERICK

CENTRIFUGAL SEPARATOR

A Dependable "AIR-SCREEN" for sizing

Fibrous, Flaky or Granular Materials

Write Us for Particulars

60 mesh to 350 mesh

RUBERT M. GAY COMPANY **114 Liberty St., New York, N. Y.**

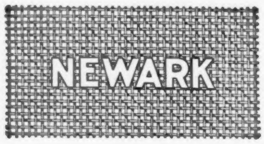
It unloaded sand and rock from gondolas all day and filled truck loading hoppers all night

An "AMERICAN" Locomotive crane owned by Butler Brothers worked practically 24 hours a day on their big Jefferson Highway contract last summer. It kept the whole job supplied with material. If it had failed there would have been a serious tie-up and much money lost.

The "AMERICAN" was the first piece of machinery to reach the job. It unloaded all the other equipment and did its own switching in addition to the sand and rock handling mentioned above.

That would be a good record for a brand new crane, but this "AMERICAN" **had already seen thirteen years of service.**

AMERICAN HOIST & DERRICK CO.
Saint Paul, Minn.
New York - Chicago - Pittsburgh - Seattle - New Orleans - Detroit



"LOCK-CRIMP"

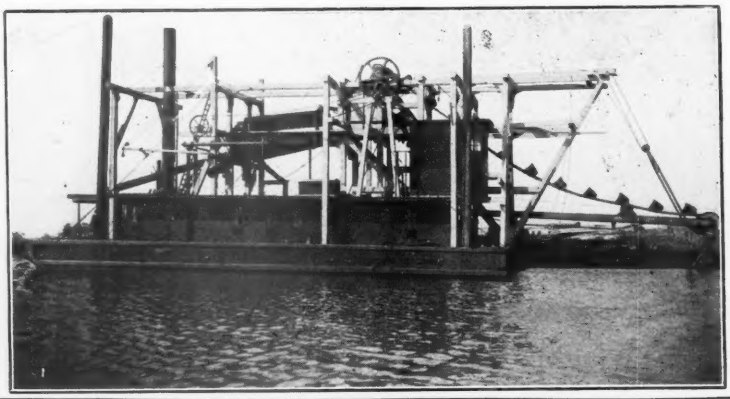
"Newark" Wire Cloth

Newark wire cloth is a product that renders high-class service. It is always reliable, and measures up to all claims made by this company. We combine an able personnel of long experience whose desire is to serve the non-metallic industry with a product that will render a full measure of satisfaction.

Wire cloth made in all metals and in all meshes—from 2-inch space to 0.0017-inch space.

U. S. S. Screen Scale

NEWARK WIRE CLOTH CO.
Newark, New Jersey



Sand & Gravel Dredges

(Bucket and Elevator Type)

Our latest bulletin describes Bucket and Elevator Type Sand and Gravel Dredges.

Send for Bulletin No. 1965

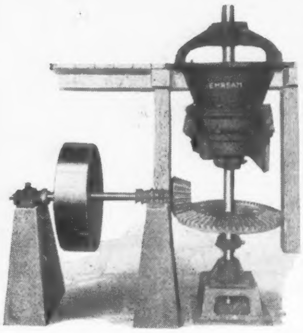
Ellicott Machine Corporation
1221 Bush St. Baltimore, Md., U. S. A.

KEEP UP WITH THE ROCK PRODUCTS INDUSTRY

TIME and money are saved and won by keeping up with the progress of industry. Changing conditions, methods, prices must be reckoned with to win success. **Rock Products** is the authoritative source of business and technical information in the rock products industry. It is edited from the field by experienced practical men.

Subscribe now and get in correspondence with **our** service and advisory departments.

EHRSAM
Rotary Crushers



These crushers are furnished in four sizes. Top diameter of bowls: 20-in., 28-in., 36-in., and 42-in., with capacities of from 5 to 60 tons per hour.

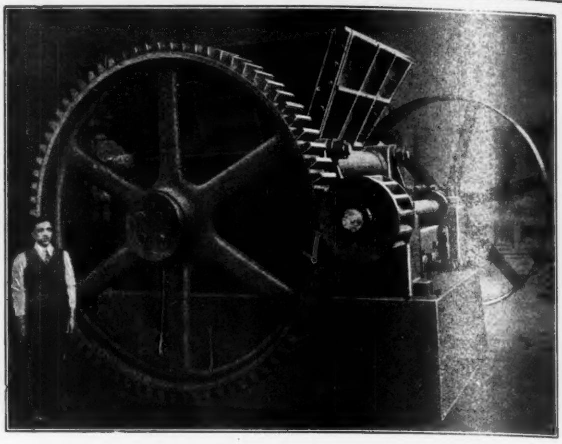
Ehrsam Rotary Crushers insure uninterrupted service. They are Ehrsam products correctly designed and constructed for efficiency and economy.

Our Gypsum Plaster Mill Machinery

- Hair and Fiber Pickers
- Elevating and Conveying Machinery
- Hammer and Revolving Screens
- Power Transmission Machinery
- Jaw Crushers
- Fine Grinding Mills
- Calcining Kettles
- Mixers

The J. B. Ehrsam & Sons Mfg. Company

Enterprise, Kansas



If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

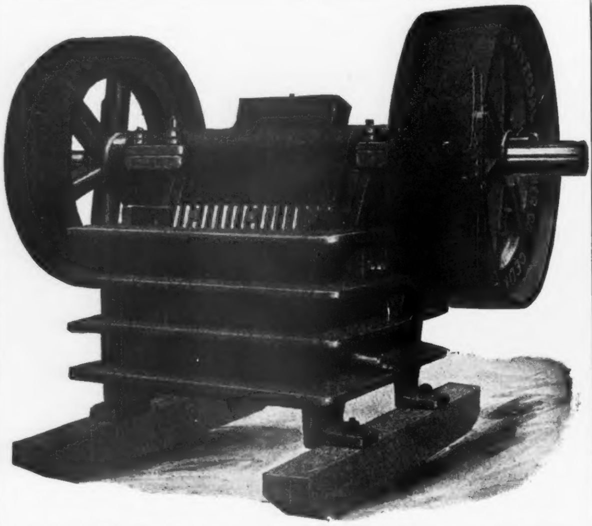
After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.

Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.



UNIVERSAL STEEL LINE

THE PERFECT GRAVEL AND REJECTION CRUSHER

Sizes up to 8"x36". Capacities 20 to 200 tons daily. Crushes to ¾" and finer if desired. Has no superior for FINE CRUSHING and UNIFORMITY of product.

STRONG LIGHT DURABLE ECONOMICAL

UNIVERSAL CRUSHER CO.

225 Third Street Cedar Rapids, Iowa, U. S. A.

Thirty Two Years Ago

The First Champion Crusher Was Built

Since that time more than 6,000 crushers have been sold and users are to be found in every country in the world. The Champion is a slow speed, steel frame crusher, with a large capacity and low upkeep cost. Made in many sizes from 50 to 1000 tons' daily capacities.

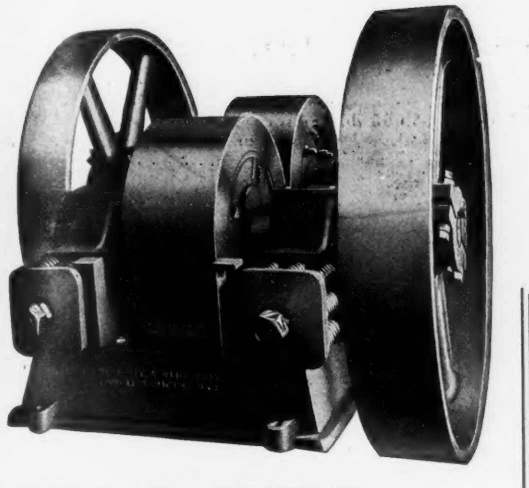
No. 20 (22 by 50) Champion Steel Rock Crusher

We design, build and install complete crushing outfits of any size desired. We specialize in the building of Elevators, Screens, and Conveyors of any desired capacity.

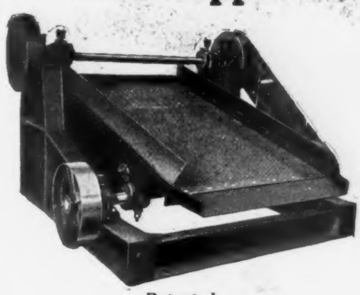
Ask for catalogue, "Champion Crushing and Quarrying Machinery." It is free.

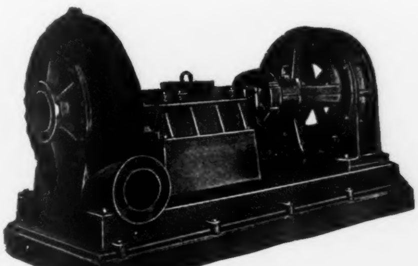
THE GOOD ROADS MACHINERY CO., INC.

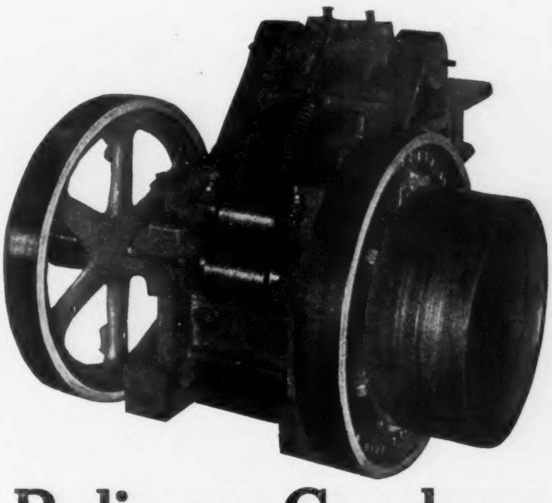
1203 Tower Building, Chicago, Ill. — Kennett Square, Pa.



Robins "Grasshopper" Screen







Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Type ads only. No cuts or illustrations permitted unless at the regular display advertising rates. Please send check with order. These ads must be paid for in advance of insertion

FOR SALE

The Equipment Sales Company specializes on Rotary Kilns, Rotary Dryers, Crushers and Tube Mills

Wire us your requirements at our expense. "If we don't have it we will get it."

INDEPENDENT LIFE BUILDING
Nashville, Tenn.

FOR SALE OR RENT

Steam Shovels on Crawlers

1—37 Marion, No. 4771, equal to new.
2—20-B Bucyrus, Nos. 3723 and 3725, used two weeks.
2—Type "B" Erie.

Pittsburgh Machinery & Equipment Co.
1302 Fulton Bldg., Pittsburgh, Pa.

For Sale—STEAM SHOVEL
⅝ YD. THEW "O" TRACTION

Thoroughly rebuilt; attractive terms for quick sale.

Walter A. Zelnicker Supply Co., St. Louis
Rails, Locomotives, Cars, Tanks, Pipe

Special Bargains

Send Us Your Boiler Inquiries

36x86 in. TRAYLOR JAW CRUSHING PLANT.
25-50-80-110 HP. Elec. Hoists.
Nos. 4-5-6-7½-9 and 10 CRUSHERS
6 and 12 ton Gasoline Locomotives.
2—DISC CRUSHERS, 36 in. SYMONS, also 28 in.
100 TON 2½ yd. ELECTRIC SHOVEL.
50—5000 ft. Steam Belt and Electric Compressors.
13x30 in., 10x18 in., 8x14 in. JAW CRUSHERS.
24x54 McLANAHAN ROLL CRUSHERS.
50 HP. D. D. HOIST, 44 OV. 3 Ph. Motor Dragline Set; also 25 HP.
NEW G. E. Gas Engine Sets, 5 and 25 Kw., 125 V.
10 and 12 ton ROAD TOLLERS.
5—7½ and 10 HP. PORTABLE CONVEYORS.
10 and 12 ton ROAD ROLLERS.
1000 GPM. UNDERWRITER'S STEAM PUMPS, 100 Lbs.
NEW No. 5 GYRATORY CRUSHER (MICHIGAN).

Send us inquiries for your wants

ROSS POWER EQUIP. COMPANY
Indianapolis, Ind.

IMMEDIATE SHIPMENT

Austin No. 3 and No. 4 Gyratories
Bonnot 5x22 ft. Tube Mills
Vulcan 8x100 ft. Rotary Kilns
Vulcan 6x120 ft. Rotary Kilns
Ruggles-Coles 5x30 ft. Dryers
Hardinge 4½ ft. x 16 in. Ball Mills
Hardinge 8 ft. x 22 in. Pebble Mills
Link-Belt 20 ton Coal Crusher

Following Sturtevant Crushers:
Jaw; 12x26 in.; 6x20 in.; 2x6 in.
Roll; 36x16 in.; 20x14 in.; 12x12 in.; 8x5 in.
Rotary, No. 00, 1, 2, 3
Ring Roll; No. 1, 2, 2-Duplex
Raymond Kent & Fuller Mills
Swing Hammer Mills, all makes
Crushers of all types and sizes

High Grade New and Used Machinery for the Entire Rock Products and Non-Metallic Mineral Industry Our Specialty

American Machinery Equipment Company **Charlotte, North Carolina**

CRUSHERS

1—24x48 Buchanan Jaw Manganese fitted.
3—No. 5 style K, Gates Gyratory Manganese fitted.
1—No. 6 style K, Gates Gyratory Manganese fitted.

STEAM SHOVELS

1—100C Bucyrus 3½ yd. dipper.
1—No. 73 Osgood 3 yd. dipper.
2—70C Bucyrus 2½ yd. dipper.
1—69 Osgood 2½ yd. dipper.

LOCOMOTIVES

Standard Gage. Saddle Tank.
8—14x22, 40 ton, 4 wh. American.
3—13x20, 30 ton, 4 wh. Baldwin.
1—13x20, 30 ton, 6 wh. Baldwin.

Also Derricks, Hoists, Buckets

T. H. LETSON COMPANY
46 Church Street New York City

FOR SALE

No. 5 Gates Gyratory Style D Crusher.
No. 6 Gates Gyratory Style D Crusher.
Two Climax No. 2—9x16-in. Jaw Crushers.
70 H. P.—13x16-in. Erie City Steam Engine.
22x48-in. Hardie Tynes Corliss Steam Engine, complete.
Two G. E., 150 H. P. Motors, Voltage 220-240.
Worthington Steam Pump, 10x8-in.; 20-in. cylinders.
Two No. 0 Thew ⅝-yard bucket steam shovels mounted Standard Railroad Trucks.
Sanderson Cyclone No. 14 Well Drill, complete.

E. W. COOPER
174 Third Ave. N., Nashville, Tenn.

For Sale

Thirty second hand, end dump, wooden quarry cars, three ton capacity, narrow-gage, and strongly built.

Price, $25.00 each

Security Cement & Lime Co.
Hagerstown, Maryland

Have you a plant for sale? Do you wish to purchase a plant? Are you in need of a superintendent or manager? Are you looking for a position as plant superintendent or manager? Advertise your wants in these columns for quick results.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Type ads only. No cuts or illustrations permitted unless at the regular display advertising rates. Please send check with order. These ads must be paid for in advance of insertion

1—50-ton standard gauge Brooks 6-wheel switcher.
1—28-ton standard gauge Shay geared locomotive.
2—9x14-in. 36-in. gauge 4-wheel saddle tank locomotives.
1—14-B Bucyrus steam shovel, mounted on traction wheels.
2—18-ton O & S bucket handling locomotive cranes.
3 miles 56-lb. relay steel rails; Hawkinsville, Ga.
20 miles 50-lb. and 56-lb. relay steel rails; Percy, Miss.

Birmingham Rail & Locomotive Co.
Birmingham, Alabama

Special, Quarry Equipment Bargains

One **Brand New** No. 7½ Traylor gyratory Crusher. Manganese fitted—complete equipment with factory guarantee. One all steel No. 18 (24") bucket elevator. Good as new. One 42"x12' all steel rotary screen. Very **little** used. Also, one 10"x18" "Good Roads" jaw crusher, on steel truck, with elevator, and a 35 hp. portable engine boiler on wheels. This outfit for $1000 cash.

H. O. CONKLIN
537 S. Dearborn St. Chicago

CRUSHERS

No. 2 Day Pulverizer
7x12 Blake Jaw Crusher
10x15 Austin Jaw Crusher
No. 4 Gates Gyratory

LOCOMOTIVES

12 ton Porter, 36 in. ga., cyl. 9x14
10 ton Shay, geared, 36 in. ga., built 1920, excellent condition

DUMP CARS

8—1 yd., 30 in. ga., Atlas V-shape
10—1½ yd., 24 in. ga., Western
12—1 yd. 36 in. ga., Koppel V-shape
10—4 yd., 36 in. ga., Western
25—2 yd., 30 in. ga., Sq. Body Quarry Cars, steel, incline end dump

Rails, Cars, Locomotives
Mid-Continent Equipment & Machinery Co.
Security Bldg. St. Louis, Mo.

FOR SALE

STEAM SHOVEL, ⅝ yard Vulcan, in first-class condition. Attractive price for quick sale. Also one 12-ton 36-inch Gauge American Saddle Tank Locomotive.

The Wilmington Crushed Limestone Co.
Melvin, Ohio

FOR SALE

Marion Model 92 Railway-Type Steam Shovel with 4-yd. dipper. Machine is positively as good as new. Is three years old but was only used in handling 200,000 yds. soft material.

A Real Buy!

F. MAYER
737 Monadnock Block Chicago

FOR SALE

1—Second hand D. C. generator, 30 KW, 240 amperes, 125 volts, connected direct to a 56 h.p. balanced valve steam engine; in A-1 condition.
1—Second hand 60 h.p. Putnam automatic cut-off steam engine; in A-1 condition.
1—Second hand Dey time register in weather and dust proof cabinet, for fifty employees; in first class order. Price $20.00.

New Holland Machine Company
New Holland, Pa.

WANTED

Steam Shovel—about 1 yard dipper. Consider purchase. Must be first class condition and bargain price, otherwise not interested. Submit complete specifications.

International Silica Company
Cairo, Ill.

FOR SALE

75 hp. 2 speed Thomas electric dragline hoist. Good as new.
No. 5 and No. 2 Allis Chalmers gyratories. Good shape.

Island Sand & Gravel Co.
Columbus, Ohio

New 2½-Yd. Steam Shovel

We have in stock for immediate shipment one FAIRBANKS 2½-YD. HEAVY DUTY RAILROAD TYPE QUARRY STEAM SHOVEL.

Write or Wire for Full Details.

The Fairbanks Steam Shovel Company
Marion, Ohio

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50', 6x60' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 4x40', 5x50' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 5x4', 3x3½' pebble and ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and 6x20' tube mills; 7½x13", 9x15", 16x10" and 12x26" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24", 36" and 40" cage mills; 3' and 4½', 6' and 8' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8', 6x5' and 4x3' Newaygo vibrating screens; Richardson automatic scales; 8' and 10' Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

ROTARY DRYERS

Thirty New Direct Fired Rotary Dryers, 4 ft. — in. diameter, 30 ft. long

These Dryers were about to be put into operation as the armistice was signed, and consequently were never used. We are offering them at a sacrifice, complete with driving mechanism, furnace irons, grates, etc. Some are equipped with steam radiators for steam heated air drying.

McDERMOTT BROS. CO.
Allentown, Penna.

· Mine Cars, Rails and Ties

We have mine cars in stock for all purposes. Also rails 12 lb. to 100 lb. section. Spikes, bolts, frogs and switches. All trade is solicited and prices cheerfully quoted.

M. K. FRANK
Frick Building Pittsburgh, Pa.

FOR SALE

One 14x18 Erie Automatic Tangy Engine, one heater and 50 ft. of 4½" piping.

The North Indiana Brick Co.
Michigan City, Indiana

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

Classified Advertising

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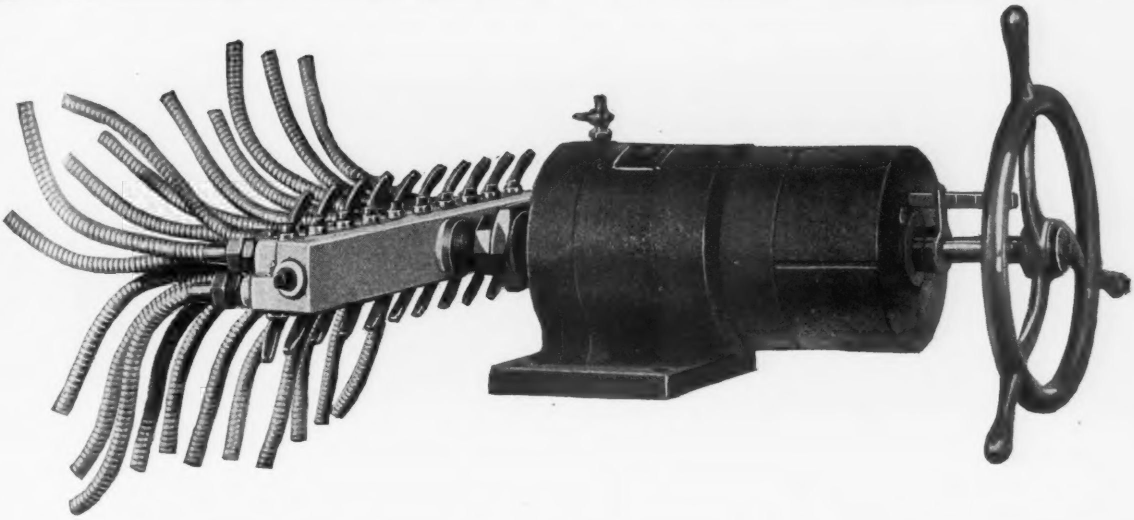
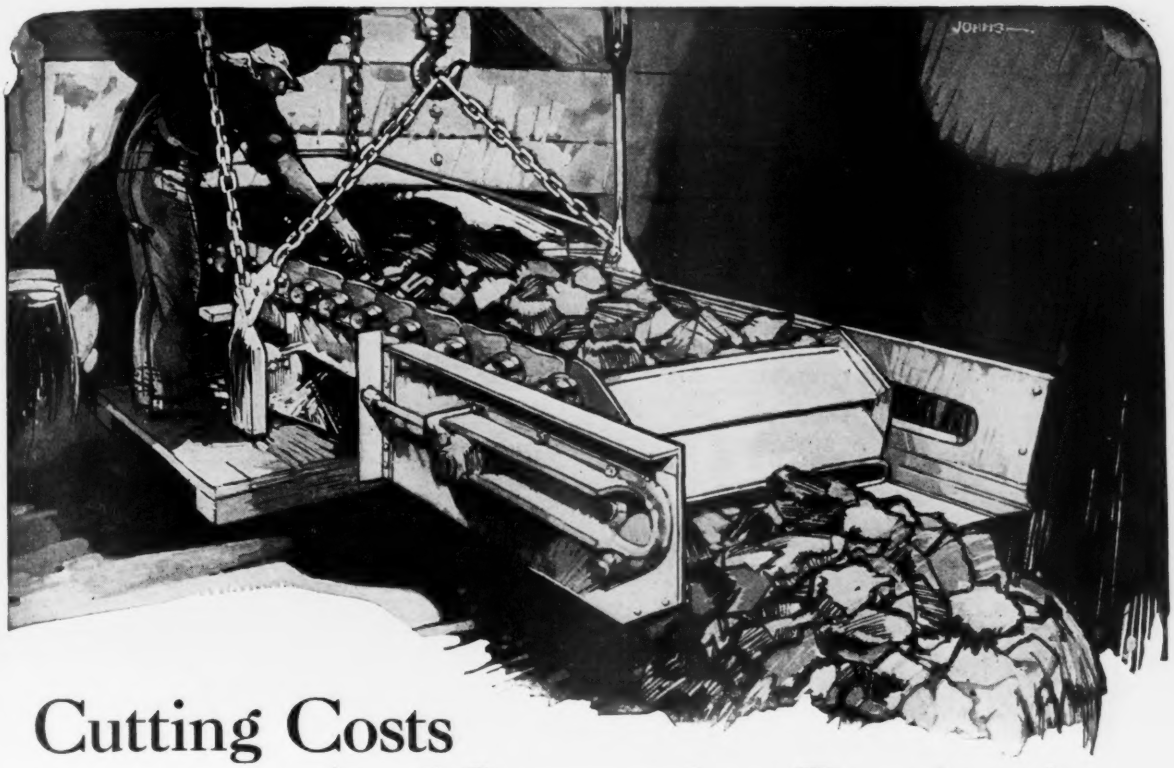




Cutting Costs And Increasing Production

Brownhoist Products

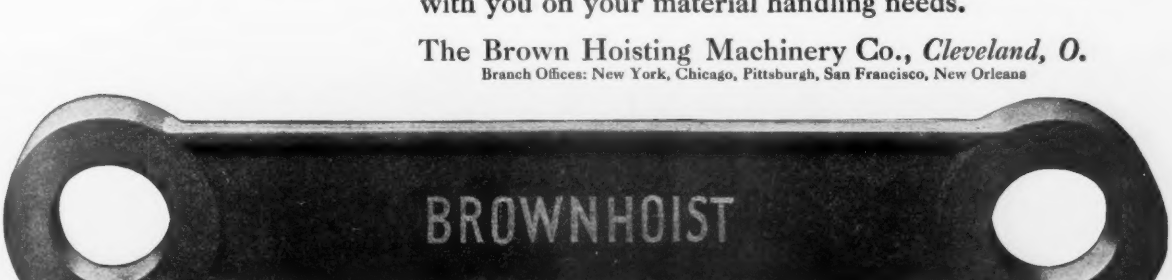
Heavy Dock Machinery
Locomotive Cranes
Monorail Trolleys
Concrete Bunkers
Chain Conveyors
Belt Conveyors
Coal Crushers
Bridge Cranes
Buckets, etc.

With a dependable conveyor to handle your materials you can cut your operating costs and increase your production. Brownhoist chain conveyors are built for hard work and will give years of dependable service.

The Brownhoist drop-forged chain link has an I-beam shaped bar, giving maximum strength and rigidity with minimum weight. Wide upset ends afford large wearing surfaces and these with the cold rolled steel pins take all the wear. Of course, these tough, oversize bearing surfaces give longer life to the chain.

For nearly fifty years Brownhoist engineers have been solving handling problems. As builders of many types of equipment, we are ready at all times to work with you on your material handling needs.

The Brown Hoisting Machinery Co., *Cleveland, O.*
Branch Offices: New York, Chicago, Pittsburgh, San Francisco, New Orleans



MATERIAL HANDLING EQUIPMENT

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

Tradepress Publishing Corporation

542 South Dearborn Street, Chicago, Illinois

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TO SUBSCRIBERS—Date on wrappers indicates issues with which your subscription expires. In writing to have address changed, give old as well as new address.

Volume 26 June 16, 1923 Number 12

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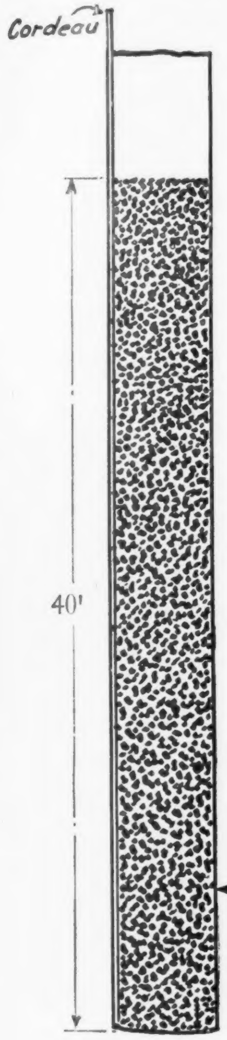
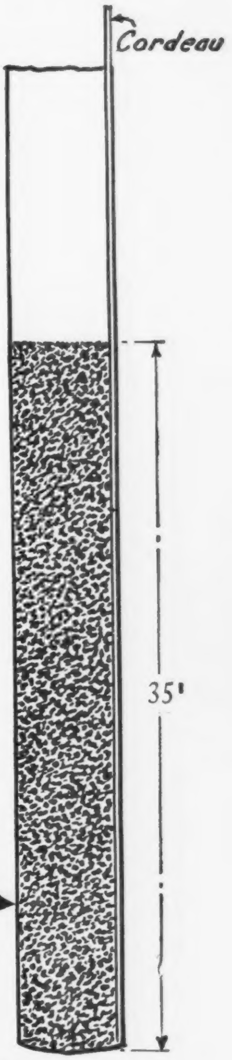
Herco Blasting Powder
for
Hercoblasting

(A New Blasting Method)





A more compact load can be made with *Herco* Blasting Powder than with other granulations. This is an advantage for Hercoblasting, in which black powder is column-loaded in well-drill holes and fired with Cordeau-Bickford. Under certain conditions this new method reduces blasting costs 30 percent.

Herco Blasting Powder contains grains of various sizes. When it is poured into the hole, the finer grains fill the spaces between the larger ones, as is shown in the drawing below. Six hundred pounds of *Herco* Blasting Powder loaded in a hole six inches in diameter makes a column approximately thirty-five feet high, as against about forty feet for FF granulation. The greater density of *Herco* Blasting Powder makes it possible to concentrate a heavier explosives charge at the toe, where it is usually most needed.

Herco Blasting Powder is also well suited for pocket loading in chambered holes.

For further information about Hercoblasting and *Herco* Blasting Powder, write to the Hercules Powder Company, 945 King St., Wilmington, Del.

Six hundred pounds of F or FF blasting powder loaded in a six-inch hole makes a column about 40 feet high.

FF Granulation
(Actual Size)

Herco Powder
(Actual Size)

Six hundred pounds of *Herco* Blasting Powder loaded in a six-inch hole makes a column about 35 feet high.

HERCULES POWDER COMPANY

Allentown, Pa.
Birmingham, Ala.
Buffalo, N. Y.
Chattanooga, Tenn.
Chicago, Ill.
Denver, Colo.
Duluth, Minn.
Hazleton, Pa.
Huntington, W. Va.
Joplin, Mo.
Los Angles, Calif.
Louisville, Ky.
New York City
Norristown, Pa.
Pittsburg, Kan.
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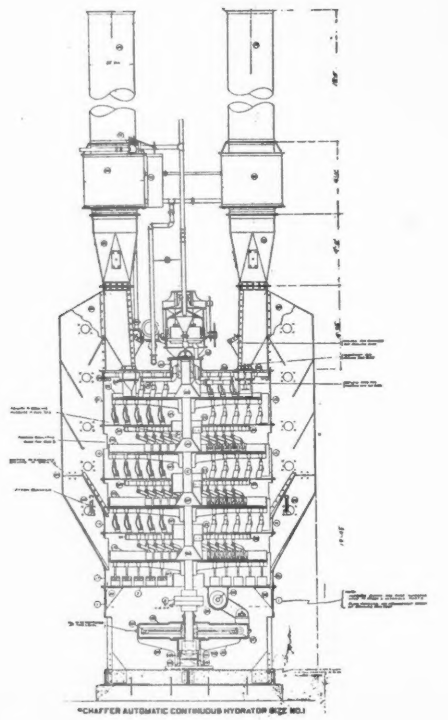
Salt Lake City, Utah
San Francisco, Calif.
Wilkes-Barre, Pa.
Wilmingon, Del.


SCHAFFER AUTOMATIC CONTINUOUS HYDRATOR SIZE NO.1